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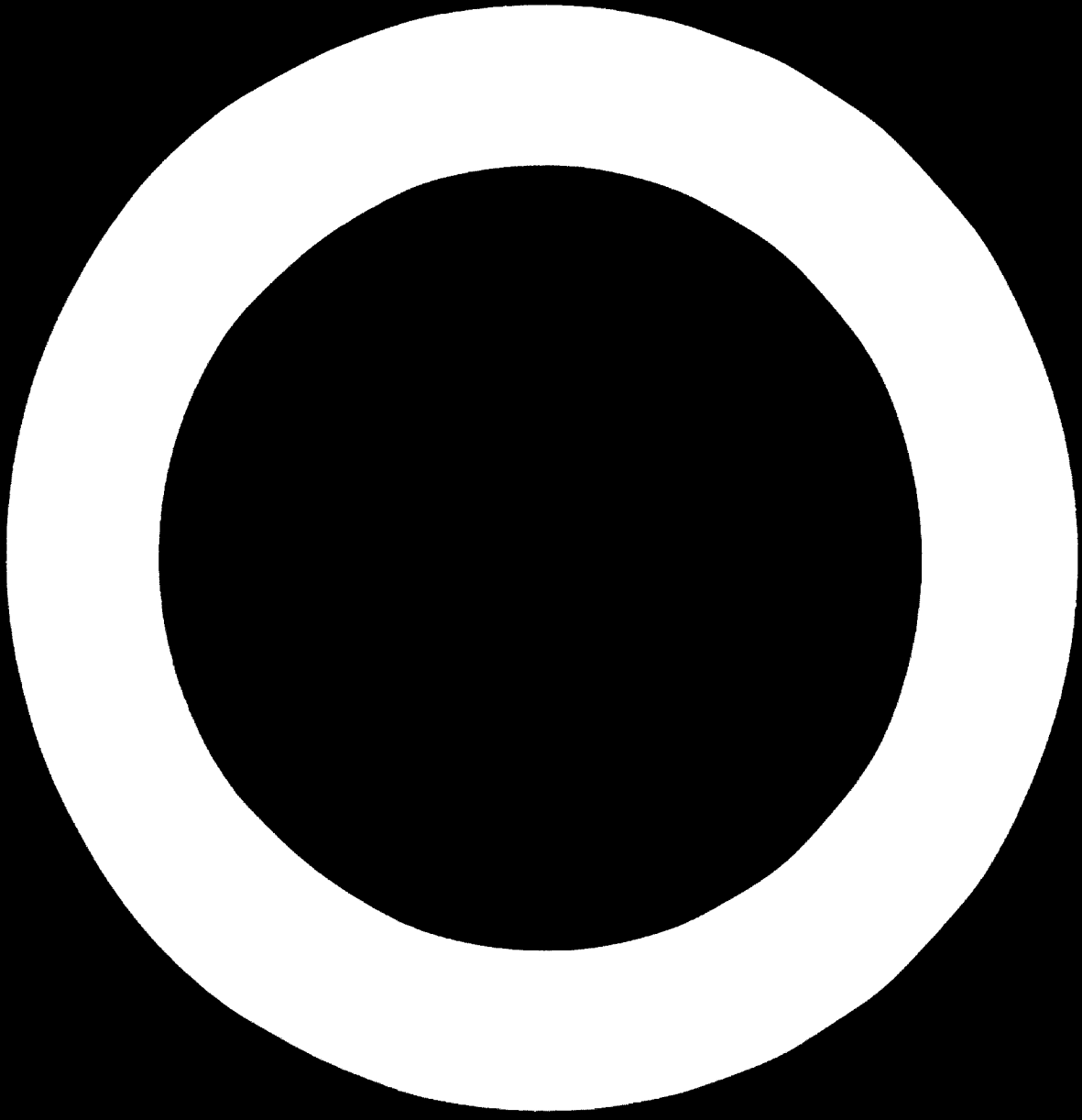
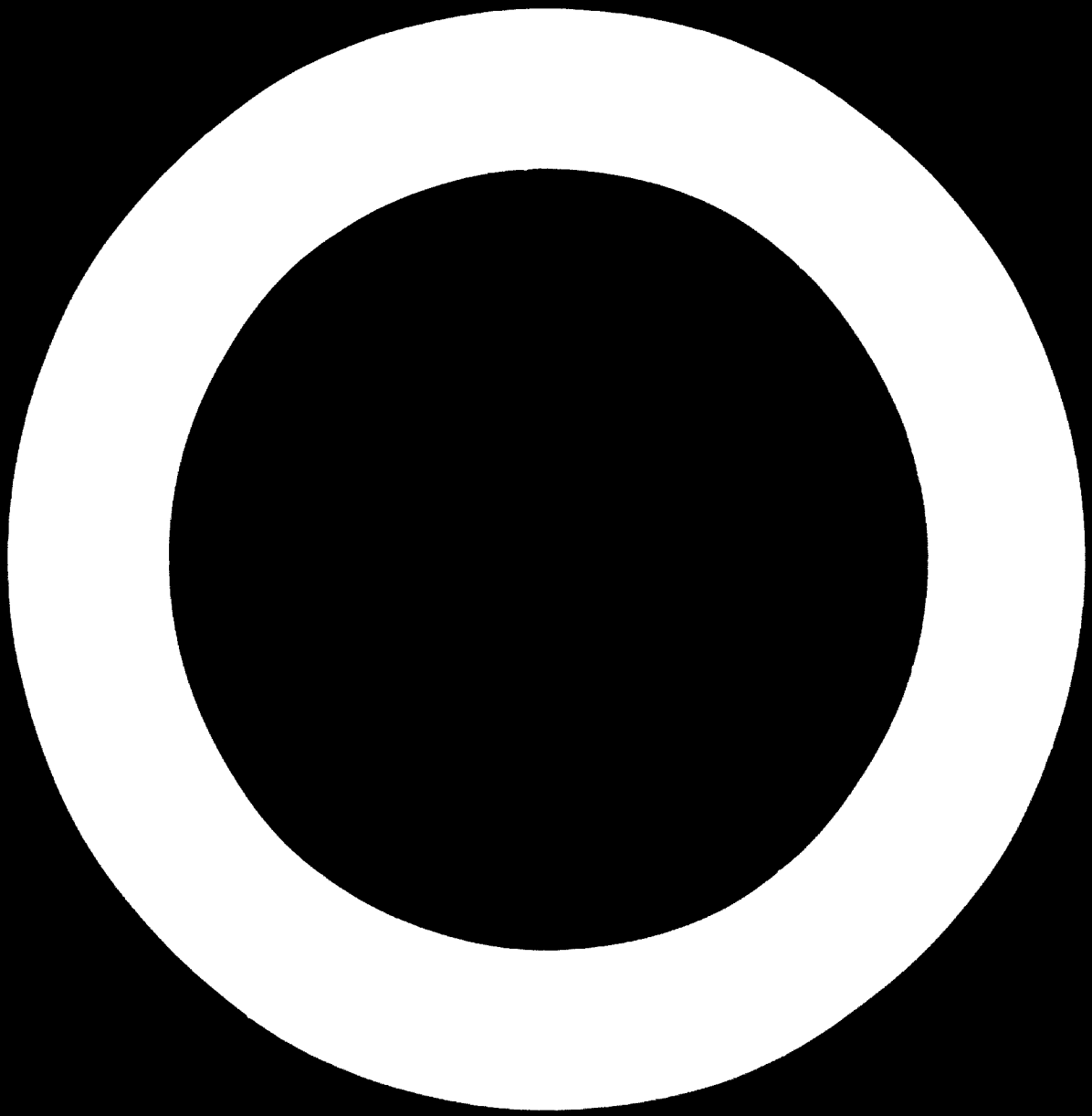
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

SELECTION OF WOODWORKING MACHINERY

Report of a Technical Meeting Vienna 19-23 November 1973





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INTRODUCTION

The Technical Meeting on the Selection of Woodworking Machinery was held at Vienna from 19 to 23 November 1973. The United Nations Industrial Development Organization (UNIDO) organized the Meeting to discuss the needs and conditions of the woodworking industries in the developing countries, with emphasis on the identification of general selection guidelines, woodworking machinery safety and maintenance and repair. The technical discussions and elaboration of guidelines were complemented by an evaluation of the catalytic role of UNIDO in the promotion of the woodworking industry in the developing countries and an assessment of the contribution that UNIDO could make to equipment selection.

CONCLUSIONS AND RECOMMENDATIONS

At the closing session, the Group carefully considered and unanimously approved the recommendations that had been formulated and variously amended by the participants.

It was recommended that the Governments of developing countries:

A. 1. Consider holding more technical fairs, since these tended to be well attended by manufacturers, and the exhibitions and demonstrations of machines would help bring to the attention of industrialists in their country the alternatives open to them;

2. Establish co-operative training centres for the mutual training of operators and/or factory inspectors;

3. Should be strongly encouraged to use all available materials and international safety standards concerning machinery and work methods; In some cases the use of this information need not await formal adoption of these standards into national legislation;

4. Should make more widespread use of the existing EUMABOIS[1/] woodworking machinery classification in the interests of clarity and precision of specifications and comparisons.

It was recommended that woodworking machine manufacturers:

B. 1. Should consider continuing to produce the simple, robust, versatile equipment that they used to produce, which often suited the needs of developing countries better than the automated, high-capacity, costly types upon which they now laid emphasis;

1/ Comité européen des construoteurs de machines à bois (EUMABOIS), 150 boulevard Bineau, Neuilly-sur-Seine, France.

2. Should make more widespread use of the existing EUMABOIS classification (see A 4 above), even if they were not members of this committee;

3. Consider preparing a classification for cutting tools patterned after the EUMABOIS machinery classification.

It was recommended that UNIDO:

C.

1. Establish a programme designed to improve the direct transfer of technology for forest-based industries between the private and governmental sectors of developed and developing countries in the broad areas of know-how, process technology, training and commercial arrangements. The preparation of a portfolio describing the specific assistance that individual organizations were willing to provide should form the basis for such a programme. A small steering committee to advise, through correspondence, on the priorities of its contents should be formed;

2. Compile information on woodworking equipment deemed suitable for use in developing countries for distribution to industrialists in developing countries;

3. Organize study tours for industrialists with decision-making responsibilities in developing countries which would incorporate lectures on machine types and selection, discussions with experts and intensive tours of selected wood products manufacturing plants;

4. Prepare a manual giving advice on how to proceed from initial show of interest, through technical questionnaire, offer, evaluation, to eventual purchase, considering that the level of technical knowledge was low in most developing countries and that there was a need to reduce dependence on local agents.

I. ORGANIZATION OF THE MEETING

1. The Meeting was convened by the United Nations Industrial Development Organization (UNIDO) and was intended to bring together participants from developed and developing countries to review critically the range of available woodworking machinery in terms of its suitability for use in the developing countries. It was attended by technical representatives of woodworking-machinery manufacturers and people occupying managerial or policy-making positions in the wood-processing industry in developing countries or persons closely associated with wood-processing research. Observers who met these qualifications also attended and actively participated in the Meeting.

2. The Director of the Industrial Technology Division opened the Meeting, on behalf of the Executive Director of UNIDO, with a statement in which he drew attention to the complex and challenging situation facing the wood-processing industry throughout the world. The Chief of the Chemicals, Pharmaceuticals and Building Materials Industries Section gave an address of welcome in which he outlined the present situation in the wood-processing industry in developing countries and the openings for improvement in the machinery and equipment sector.

3. The Meeting was attended by 24 participants from the following countries: Australia, Austria, Belgium, Colombia, Czechoslovakia, Finland, France, Federal Republic of Germany, Ghana, Guyana, India, Philippines, Romania, Sweden, Tunisia, the United Kingdom of Great Britain and Northern Ireland and the United States of America.

4. There were 27 observers, from: Austria, Belgium, Canada, Finland, France, Federal Republic of Germany, Italy, Liberia, Philippines, Romania, Singapore, Spain, Sweden, Switzerland, Tunisia, Turkey, the United Kingdom of Great Britain and Northern Ireland and Yugoslavia.

5. V. R. Sonti was elected Chairman, A. Villière Vice-Chairman, and M. W. Page Rapporteur. A. V. Bassili, of the Construction and Building Materials Industries Section of the Industrial Technology Division of UNIDO, served as Secretary to the Meeting.

6. The agenda, which is presented in annex I, was adopted unanimously.

7. In all, 35 documents[2/] dealing with topics related to the agenda had been commissioned by UNIDO and were distributed to the participants (see annex II). English and French were the official working languages of the Meeting.

2/ A limited number of copies of these documents in the language in which they were issued (English or French) are available upon request, as are summaries of the documents in English, French and Spanish.

II. NEEDS AND CONDITIONS OF THE WOODWORKING INDUSTRIES IN DEVELOPING COUNTRIES

8. The Meeting took note of six papers relating to conditions prevailing in certain developing countries and the effects they had upon local woodworking industries.

9. In his paper entitled "Needs and conditions of the woodworking industries of the Philippines" (ID/WG.151/3), H. P. Brion drew attention to the low level of technical competence in the woodworking industry sector and to the need for technical support from the equipment manufacturers, which was not always forthcoming. C. F. Collins also pointed out the shortcomings of the before- and after-sales services provided by manufacturers' agents, in his paper entitled "Needs and conditions of the woodworking industry in Guyana" (ID/WG.151/10).

10. In the latter country, as in numerous other developing countries, equipment costs was the all-determining factor. It was suggested that manufacturers adopt a more flexible approach to what constituted a salable item. Joint ventures were deemed advantageous and possibly the means for the introduction of knock-down equipment for "do-it-yourself industrialists". In any event, the local manufacture of basic components, coupled with the importation of high-precision parts, could provide a means of improving local equipment resources, while the utilization of reconditioned machinery could also be profitably considered.

11. In his paper entitled "Needs and conditions of the wood-processing industries in West Africa" (ID/WG.151/11), G. Noel proposed a gradual three-stage approach, progressing from domestic markets through regional or community markets to export markets. He also drew attention to the problem of training local labour in needed skills.

12. M. W. Page presented a paper entitled "The conditions and needs of the forest converting industries in West Malaysia, Papua, New Guinea and Fiji" (ID/WG.151/19), in which he also referred to Indonesia. He underscored the

need for an integrated approach in the woodworking sector, encompassing logging, milling and manufacturing of wood products. In drawing attention to the enormous potential markets for equipment manufacturers in the regions described in his paper, the author stressed that the equipment should be appropriately related not only to the species of timber being processed, but also to the operation and maintenance skills available.

13. The Meeting's attention was also drawn to the difficulties of marketing non-preferred wood species, which constituted the bulk of the forests' standing volume. This latter problem could be alleviated to a certain degree by grouping these species according to end-uses.

14. In his paper entitled "Wood, wood-based and woodworking machinery industries in India" (ID/WG.151/26), V. R. Sonti spoke against restrictions upon the importation of woodworking machinery, as they destroyed any incentive to improve local manufacture and design. Closely associated with this problem was that of having machinery manufactured locally by persons who paid no consideration to end-uses. Steps must be taken to improve this situation.

15. A paper entitled "Needs and conditions of the woodworking industries in developing countries: some points to consider" (ID/WG.151/37) was presented by a member of the UNIDO secretariat. It emphasized the need for unbiased advice in purchasing equipment. Developing countries hitherto had suffered from limited familiarity with available machinery. Furthermore, it had to be remembered that equipment complemented rather than replaced human resources.

16. Reference was made to the dangers of promoting craftsmen to junior supervisory positions, thus often exceeding their level of competence.

17. The advisability of purchasing reconditioned as opposed to second-hand equipment was the subject of lengthy debate, the final consensus being that the appropriateness of the purchase depended on the degree to which primary and secondary processing was involved. It was felt that reconditioned machinery was not appropriate to primary processing, but second-hand equipment that had been reconditioned could be used for secondary processing where the utilization factor was less intensive and the machines were not normally integrally linked units of the processing line. It was also pointed out that, generally speaking, the utilisation of reconditioned second-hand machines was not a factor for increasing the technological level of developing countries.

18. In this context, discussion also centred upon the degree of sophistication and labour intensity required. It was generally agreed that requirements in the woodworking industry varied in relation to the country's stage of development in that sector, and it was felt that a classification system should be devised whereby actual requirements in terms of sophistication and labour intensity could be established. It was pointed out that some countries required machinery manufacturers to sell through local agents, a factor which added significantly to the equipment costs and, since many agents lacked technical knowledge, provided no improvement in technical services.

III. GENERAL SELECTION GUIDELINES

19. In presenting his paper entitled "General selection guidelines for woodworking machinery" (ID/WG.151/6), A. Travnik outlined a machinery selection system aimed at achieving the optimum techno-economic solution, although he did not fail to stress the complexity of the problems involved. Suggestions included due consideration of guarantees and of the value of buying machinery with some excess capacity.

20. The above contribution was complemented by a paper, prepared by the ECE/FAO Timber Division, entitled "Some economic and commercial factors determining the selection of woodworking machinery" (ID/WG.151/23) in which the need for pre-investment studies were highlighted. The paper also drew attention to the fact that the maintenance of a large unskilled labour force could, in the final analysis, be self defeating. It was also stressed that any plans for expansion in the woodworking industry sector should be integrated with any similar expansion plans conceived by other agencies or authorities in the country.

21. These findings were amplified by V. Radulescu in his paper entitled "Criteria for the acceptance and ascertainment of the technical standard of machine tools for woodworking operating by removal of chips or particles" (ID/WG.151/25) in which he enumerated the technical criteria to be observed prior to accepting machinery.

22. In the ensuing discussion, the Meeting attached particular importance to the need in the developing countries for unbiased services. It was felt that more direct communication between the manufacturer and equipment user was badly needed. Manufacturers' representatives abroad should be well versed in technical matters, and manufacturers should endeavour to upgrade their agents' qualifications so as to ensure that they could provide the services expected of them.

23. It was also agreed that government institutes and industry-sponsored advisory services could provide more comprehensive advice. However, it was pointed out that full advantage was not being taken of services currently available. In this connexion, it was suggested that research institutes devote themselves to matters more applicable to daily usage. Such an applied science approach could also be profitably supplemented by demonstration-cum-development centres set up by international agencies which could supply the unbiased advice so badly needed in addition to appropriate training and maintenance service.

IV. STANDARD CLASSIFICATION AND TERMINOLOGY IN THE WOODWORKING INDUSTRY

24. In his paper entitled "Standardized classification and terminology in the woodworking machinery industry" (ID/WG.151/14), H. Eldag described the manner in which standard classification and terminology had been introduced in certain European countries. He outlined the steps taken to update the system and the attempts that were being made to apply it on an international scale. In the latter connexion, he stressed the need for co-operation between the manufacturers and the users of tools and equipment to ensure the comprehensiveness of the terms used, thus facilitating comprehension and translation.

25. In the discussion of the paper, the Meeting noted the work being done by EUMABOIS on the task of re-classification and expressed the hope that the speakers' suggestions be taken into consideration.

26. The participants from the developing countries emphasized the need for a standard classification which, in their opinion, would facilitate the assessment of customs duties, levies and taxes as well as the issuance and comparison of tenders.

27. The Meeting felt that the national associations of woodworking machinery manufacturers which were not members of EUMABOIS should seriously consider increased collaboration with it. Companies were encouraged to print the EUMABOIS classification on their sales documentation, thus following the example of several European countries.

28. It was the consensus that a detailed technical nomenclature should be prepared in several languages, with care being taken to provide ample illustrations. The Meeting requested that EUMABOIS accord this matter high priority.

29. In emphasising the need for updated classification and terminology, the Meeting pointed out the contribution such updating would make to the improved efficiency of machinery selection in both developed and developing countries.

V WOODWORKING MACHINERY SAFETY

30. In his paper entitled "Safety and health in the design and use of woodworking machinery" (ID/WG.151/9), W. Vought indicated the magnitude of the problem on a world-wide basis. The precautionary measures which he outlined were presented in terms of the operator, the machine and the working environment - general solutions being offered in each case.

31. In the discussion which ensued, the Meeting felt there was a need for ergonomic design suited to local conditions and work methods.

32. With respect to the importation of both used and new machinery, it was agreed that certain standards of safety should be observed. Such standards - be they of national or international character - could profitably be applied prior to the adoption of formal legislation. The attention of the developing countries was drawn to existing standards, which could be well adapted to local needs.

33. Among the health hazards discussed was noise. Whereas the primary responsibility for the production of machinery with a low noise level lay at the design stage, maintenance and repair were also felt to be contributory. Another health hazard was that of dust, which was best overcome by properly designed and maintained dust-extraction systems. It was stressed that particular attention should be devoted to this problem when processing certain woods and treated timbers. Also in connexion with treated timbers, the pollution hazards arising from their waste disposal were noted as a matter of concern.

34. The Meeting stressed the value of training programmes, into which safety-oriented aspects should be integrated. A further component of such a programme should be training of supervisory staff - where possible in the machine manufacturer's plant.

35. Noting the difficulties arising in connexion with the transmittal of technical information, the Meeting suggested that, in future, manufacturers issue instruction manuals in a locally understood language and with copious illustration.

36. The Meeting's attention was drawn to an existing co-operation programme between Indonesia and the Philippines which provided for industrial co-operation, including training of labour from one country by the other. It was generally felt that this concept should be promoted by Governments in the interests of improved safety inspection methods, an expansion of this approach being the establishment of regional operator training centres in the developing countries.

VI. SELECTION OF EQUIPMENT FOR LOG BREAKDOWN

37. In their papers entitled "Selection of equipment for log breakdown using bandsaws" (ID/WG.151/34 Rev.1) and "Selection of equipment for log breakdown: band saws, frame saws and chipper headrigs" (ID/WG.151/28), respectively, G. Gillet and P. Imbery drew attention to certain conditions pertinent to tropical hardwoods, as well as to the need for all machinery and equipment manufacturers to solve specifically the problems with which the users would be confronted. They also described the currently available range of machinery, indicating the main advantages of the different machines.

38. In the discussion which followed, the Meeting took note of the equipment considered suitable by the speakers, including views expressed in Page's paper (ID/WG.151/19). It stressed the importance of performing an in-depth market study before selecting machinery, since domestic and export market requirements were not necessarily the same.

39. The trend towards fuller utilization of the wide range of tropical wood species by the developing countries was emphasized, as well as the need to integrate manufacturing lines with sawmills. The Meeting felt that the most general need was for simple mechanisms in the sawmills but that specific economic surveys could lead to the installation of advanced equipment, bringing production and waste to intended levels.

40. In the more specific discussions, it was felt that frame saws could only be used to a limited degree to breakdown tropical hardwood logs. Though less flexible than band mills, frame saws could be considered for re-sawing purposes; their particular usefulness lay in the sawing of fixed-dimension lumber.

41. With respect to bandsaws, emphasis was placed on the selection of correct sawing techniques (patterns) in order to ensure that maximum value was obtained from tropical species.

42. Twin saws (band or circular) were recognized as being potentially suitable for sawing logs containing high growth stresses. Whereas both band and circular saws were subject to log size limitations imposed by feed chains, circular saws themselves limit log size.

43. It was noted that chipper headrigs were basically designed for small softwood logs (maximum diameter 40 cm); sorting was necessary for an economically acceptable yield, with a strong demand for chips being essential. However, chipper headrigs were deemed insufficiently flexible for all situations and experience was lacking for a proper evaluation of their use in the processing of tropical hardwoods.

44. The Meeting felt that mobile sawmills were useful in the developing countries for processing medium-sized to large-sized logs, particularly those with defects that would otherwise cause them to be left in the forest, deemed uneconomic for processing in conventional sawmills. It was recognized that mobile sawmills in the forest could reduce transport costs by producing flitches for subsequent re-sawing elsewhere, timber for local consumption and for railway sleepers.

45. In his paper entitled "Selection of machinery for the production of veneer" (ID/WG.151/29) C. Massoneau summarized the equipment available in this processing sector, pointing out that vertical slicers are most suitable for use in developing countries for reasons of quality of cut, safety, ease of maintenance and better yield as compared with horizontal machines. He stressed the need to sort or classify wood according to its behaviour throughout the peeling, slicing and drying operations.

46. The Meeting agreed that automation was needed for small-log peeling if production was to be economic. Increasing importance was being attached to the development of specialised equipment for peeling small logs.

47. Note was taken of the trend towards simplified, low-cost veneer plants within forest areas for processing lower-quality logs as well as logs of species susceptible to deterioration during transport. Such mills used simple, sturdy equipment available at a fraction of the cost of the conventional veneer mills, and the veneers produced were shipped green - thus eliminating the need for dryers. However, it was pointed out that green veneers prone to insect and fungal attack should be treated before shipment.

VII. SELECTION OF EQUIPMENT FOR REMANUFACTURING

48. In his paper entitled "Selection of planing and moulding machines for developing countries" (ID/WG.151/21) L. Wissing traced the development of planing and moulding equipment from simple one-side machines to heavy-duty, multiple-headed ones. He also reviewed tool placement, grinding equipment, cutter-head configurations and auxiliary devices needed for smooth production flow. B. Bolin, speaking on behalf of the author, stressed the need for specific, accurate replies to technical questionnaires, thus helping the manufacturer to match his machine to the needs of the customers.

49. In discussing the recommended feed speed of 10 m/min per knife at 5,000 revolutions per minute, which together produced an acceptable finish (cutter pitch 2 mm), the Meeting noted the difference in feed speeds of United States as opposed to European and Japanese machines. Whereas United States machines operated at up to 300 m/min for particular applications such as sash mills, their Japanese and European counterparts ran at only 50 m/min.

50. In this connexion, it was pointed out that, in developed countries, feed speeds above 50 m/min require mechanical in-feed and out-feed devices. Hardwoods could, in general, be fed more rapidly - the limit being set by the characteristics of the species.

51. It was remarked that the skills needed to prepare heads for high rotational speeds were not usually available in developing countries, and that a one-knife finish at slow feed speeds was generally tolerated.

52. The Meeting agreed that future prospects for abrasive planing were lower than originally anticipated, but that a machine incorporating both cutting and sanding heads had definite possibilities.

53. Although square cutter blocks were less expensive than circular heads, it was generally agreed that they were far more dangerous.

54. It was recognized that recent improvements in production accuracy for lumber had permitted European manufacturers to use lighter-weight machines for subsequent machining of sawnwood.

55. The general principle of decreasing set-up times and breakdowns was emphasized as being of greater value than attempting to increase operating speeds. This was felt to be particularly valid for developing countries, where small markets made short runs the rule.

56. Following this discussion, a paper entitled "Selection of machinery for remanufacturing: circular saws" (ID/WG.151/17) was presented on behalf of A. Mattison, in which various machines using circular saws were described, with particular emphasis on their wide range of uses. The versatility and accuracy of double-end cut-off saws and tenoners were stressed, and chain-fed gang rip saws were claimed to be better than roller-fed machines for high-volume production.

57. In the ensuing discussion, it was pointed out that straight-line rip-saws are used in many developing countries to reduce random-width stock prior to moulding.

58. The recent developments in computer-controlled sawing were acknowledged, but were considered inappropriate at this stage for developing countries.

VIII. SELECTION OF EQUIPMENT FOR MACHINING AND OTHER OPERATIONS

59. H. Eldag presented a paper entitled "Boring and mortising: technology and equipment" (ID/WG.151/33), in which he drew attention to the multiplicity of uses for which the boring process was applicable and the consequent reductions in terms of capital investment, operating and maintenance costs and tooling requirements that it made possible. He pointed out that research had shown that dowel joints were stronger than conventional mortise-and-tenon joints.

60. In reply to a query about the cost of sophisticated pneumatic borers, Mr. Eldag stated that they were cheaper than the machinery required for conventional mortise-and-tenon joints, easier to set and faster in operation. However, they were unsuitable for heavy work, and their air consumption was comparatively high. It was pointed out that simple machines using these borers could be easily put together in developing countries.

61. In relation to developing countries, it was noted that dowel joints were dependent on the availability of suitable glues, and that a further complication was the incompatability of certain tropical wood species with various adhesives.

62. H. Eldag presented a second paper, entitled "Sanding and polishing machinery" (ID/WG.151/35), in which he stressed the fact that sanding costs were strongly influenced by the quality of pre-machining.

63. The Meeting pointed out that the introduction of mechanical sanding into many developing countries had to await the availability of locally manufactured abrasive papers of adequate quality.

64. E. van der Straeten presented a paper written by himself and J. Reinhardt, entitled "Selection of equipment for joining" (ID/WG.151/18), in which attention was drawn to the need to understand the basic principles underlying jointing

operations, as well as to the fact that, in the opinion of the authors, automatic machines did not necessarily guarantee high quality output. Simple machines, however, were not to be recommended for veneer jointing.

65. In response to a question on panel joining by dowelling or finger-jointing, the speaker pointed out that boring and panel accuracy were limiting factors in dowelling, whereas continuity of glue spread was difficult to achieve in long joints.

66. In his paper entitled "Selection of nailing and stapling machines" (ID/WG.151/20), C. Reich traced the development of nailing machines from their original manually fed designs to the present automatic-loading variety, which had developed along with accurately calibrated nails. He stressed the importance of nail quality and covered the production of crates, boxes and pallets, using machines of varying degrees of automation.

67. In the ensuing discussion, it was pointed out that the poor dimensional accuracy of nails in the developing countries frequently impeded the operation of automatic machines, but that head concentricity, in particular, could be improved by changing the chucks in the nail-making machines more frequently.

68. A paper entitled "Selection of equipment for assembling wood structures and frames using metal connectors" (ID/WG.151/31) was presented by R. Williams on behalf of its author, J. Stokes, in which spiked metal connector plates were defined and their designs reviewed. Heavy galvanising of connectors for use with tropical hardwoods was advocated, as was the avoidance of stainless steel because of its cost. Williams stressed that the main use of spiked metal connector plates was in structural applications, including trusses of wide span.

69. In the discussion which followed, it was stressed that spiked connector plates should be mechanically driven and not manually hammered to ensure joint strength. On the other hand, in very small plants, adequate joints could be obtained using separate connector plates and nails, provided the latter were hammered into place with care.

70. R. Koch presented a paper entitled "Selection of spreading and coating machines for the woodworking industries" (ID/WG.151/27), in which he highlighted the range of coating, spreading and finishing processes and equipment, stressing the importance of surface preparation and control of ambient conditions. He pointed out that the most basic machines lent themselves to both manual and mechanical processes.

71. The Meeting took note of the improvements in coating preparations which approached the finish of laminates and thus might tend to replace them.

72. The Meeting noted that electrostatic spraying was more sophisticated than normal air-spray techniques, posed difficult maintenance problems, required special skills and proved troublesome under humid conditions.

73. Airless spray guns were considered suitable for spraying flat areas, but they required skilled operators to avoid wastage of finishing material owing to high delivery rates. Conventional air-spray guns were felt to be best for the developing countries because of their simplicity. However, it should be remembered that coating materials were more expensive than labour, so the cost of good equipment was justified.

74. Spray booths were felt to be simple enough to be made in developing countries; dry booths with a minimum air velocity of 25 to 30 m/min were recommended for furniture plants, since both initial and maintenance costs were lower than those for wet booths.

75. In relation to a question on the comparative costs of curtain coaters and roller coaters, it was pointed out that, although the initial costs of curtain coaters were higher, maintenance costs were less and operating costs might be 10 to 20 per cent lower. These economies resulted from better control of spread and less reliance on operator skills.

76. The Meeting did not advocate the use of ultra-violet drying equipment for developing countries, since it called for skilled maintenance and was sensitive to high humidity. However, Koch was of the opinion that it would become increasingly important over the next decade.

77. H. Syberts presented a paper entitled "Selection of finger-jointing machines" (ID/WG.151/5) in which he urged direct technical consultations with the manufacturers. He emphasized a step-by-step progression towards sophistication and the necessity of maintaining a high technical level of machines from the very inception. He predicted that, in the tropical hardwood regions, finger jointing would become increasingly important.

78. In the ensuing discussion, the Meeting noted that dense hardwoods were being successfully finger jointed and glued in Australia.

79. It was reported that die-formed finger joints were suitable solely for non-structural applications.

80. In his paper entitled "Multi-purpose machines and multi-purpose processing lines for the woodworking industry" (ID/WG.151/16), M. Eldag reviewed a range of combination machines and emphasized their extreme versatility and high capacities. He emphasized the advantage of a single location of the workpiece for a number of machining operations. He added that simpler models were currently available which were suitable for developing countries and to which attachments could be added to achieve progressively higher degrees of automation. In view of the great advances made in the field of multi-purpose machines and processing lines, the author suggested that classification be extended - a suggestion in keeping with that made in his previous paper "Standardised classification and terminology in the woodworking machinery industry" (ID/WG.151/14).

81. It was felt that this type of machine, which is highly automated, could find application only in those special conditions in developing countries where large-scale production of components for export markets was envisaged, particularly since many furniture manufacturers in these countries were tending towards assembly of finished stock. The Group noted that such automated production required improved management skills and plant layout, while breakdowns could prove costly.

82. The Meeting also expressed its appreciation of the problems caused by differences in equilibrium moisture contents between many developing countries and their potential export markets, as well as the need to produce for a variety of specifications.

83. Joint venture opportunities of sufficient magnitude to warrant this type of equipment existed in many developing countries. The success of such opportunities was contingent upon improved means of technical communication. However, a cautionary note was added in connexion with incompletely considered turn-key proposals.

II. SELECTION OF EQUIPMENT FOR MISCELLANEOUS OPERATIONS

84. S. A. Segal presented a paper entitled "Selection and maintenance of cutting tools for the woodworking industry" (ID/WG.151/13), in which he gave a detailed explanation of tooth designs with respect to cutting efficiency, service life and power requirements. This paper was followed by O. Stier's presentation, entitled "Woodworking tool maintenance and selection of tool room equipment" (ID/WG.151/32), in which he maintained that the fundamental characteristics of tropical woods could be compared to those of European species and, except for certain abrasive species, they could be worked with tools of the same types. He differentiated between plunge and tooth-following grinding methods and described a range of grinding equipment. Swageing, setting and hardening methods and equipment were reviewed and, where hard tipping was necessary, preference for stellite was expressed.

85. In comparing the service life of various hardened cutting edges, it was observed that, by high-frequency hardening, stellite tipping and carbide tipping, service life was increased by 1.6, 8-10 and 20 times, respectively, when cutting abrasive woods, and even more with softer woods. Carbide tipping was not deemed suitable for band-saws.

86. It was regretted that, whereas equipment classification existed, a tool classification had not yet been prepared.

87. Emphasis was placed upon the need to study the economics of extra equipment and labour costs when considering the adoption of stellite tipping. It was pointed out that stellite-tipped tools could be reground with any mechanical tool-room equipment, except that side-dressing equipment was also essential.

88. It was stated that tool quality should be at least that of the machines, and that safety inspections could well be done during grinding, maintenance and storage.

89. A general discussion on portable and hand tools was introduced by the UNIDO secretariat, in the course of which one participant claimed that there was no basic difference between heavy-duty (industrial) portable tools and the "do-it-yourself" variety.

90. Attention was drawn to the fact that the hazards were greater with hand-held tools, and that protable circular saws were regarded as unsafe when their diameters exceeded 35 cm.

91. The Meeting recognised that manufacturers of portable tools might not be required to comply with recognised safety standards, and that purchasers should ensure that the equipment they bought complied with a recognized standard. Some participants considered electric power tools to be more convenient than pneumatic tools.

92. It was stated that maintenance costs on portable tools could constitute a major proportion of the purchase price.

93. A. Smith's paper, entitled "Dust control and waste extraction" (ID/WG.151/8), was presented on the author's behalf by the UNIDO secretariat. The paper summarised current technologies in the field, pointing out difficulties associated with certain machines and enumerating the points to be considered when establishing an efficient collecting system for a woodworking plant. Possible uses for the waste thus collected were indicated.

94. There was a consensus that there was a clear need for increased research into residue utilization, thus reducing waste. It was further pointed out that the risk of explosion associated with fine dust could be reduced by maintaining sharp cutting edges on the tools.

95. It was agreed that sufficient data had been published to enable industrialists in the developing countries to design and construct their own pneumatic collecting systems.

96. In his paper entitled "Selection of wood drying equipment" (ID/WG.151/12), A. Villière described the whole range of drying procedures and equipment, drawing particular attention to production factors and wood quality, which greatly influenced the economics of the operation. He pointed out that where kiln-drying after air-drying is to be considered, the lumber would have to be stacked in the yard in such a way that it might be loaded directly into kilns, otherwise handling costs were increased.

97. In the ensuing discussion, the Meeting took note of other non-conventional drying methods, such as the Dutch hot chambers and dehumidifiers. With dehumidifiers, as drying proceeded below 15 per cent moisture content, electricity cost costs rose disproportionately. It was felt that alternative energy sources for this type of drying could be profitably investigated.

98. It was noted that, in Australia, eucalyptus species containing high growth stresses were successfully dried in flitch form and re-sawn after stress-relieving high-humidity treatment.

99. The paper prepared by R. A. Plumptre entitled "Solar kilns: their suitability for developing countries" (ID/WG.151/4) was presented on his behalf by the UNIDO secretariat. It was pointed out that solar kilns were still at the experimental stage and there remained problems with the control of temperature and humidity. Their future was considered uncertain.

100. V. R. Sonti presented a paper entitled "Selection of equipment and preservatives for wood preservation" (ID/WG.151/22), in which he stressed the need to preserve secondary species to increase their utilisation potential. He also differentiated between organic and inorganic preservatives, explaining that the organic preservatives were preferable, as they did not increase the moisture content of the treated timber. Regrettably, the solvents and equipment required for organic preservation made that form of treatment more expensive, and thus inorganic chemical compositions such as copper-chrome-arsenic compounds were widely used.

101. The Meeting discussed the merits of the borax dip-diffusion treatment to provide protection against decay, and considered that wider use could be made of this process.

102. The Meeting recognised that sap-displacement methods were simple and suitable for treating round hardwood in developing countries.

103. It was agreed that improved methods for treating glued laminated structural elements (glulam) were desirable.

104. The Meeting also noted the paper entitled "Quality control procedures and equipment for the secondary woodworking industries" (ID/WG.151/30) by E. Antodor-Berceanu and V. Platon.

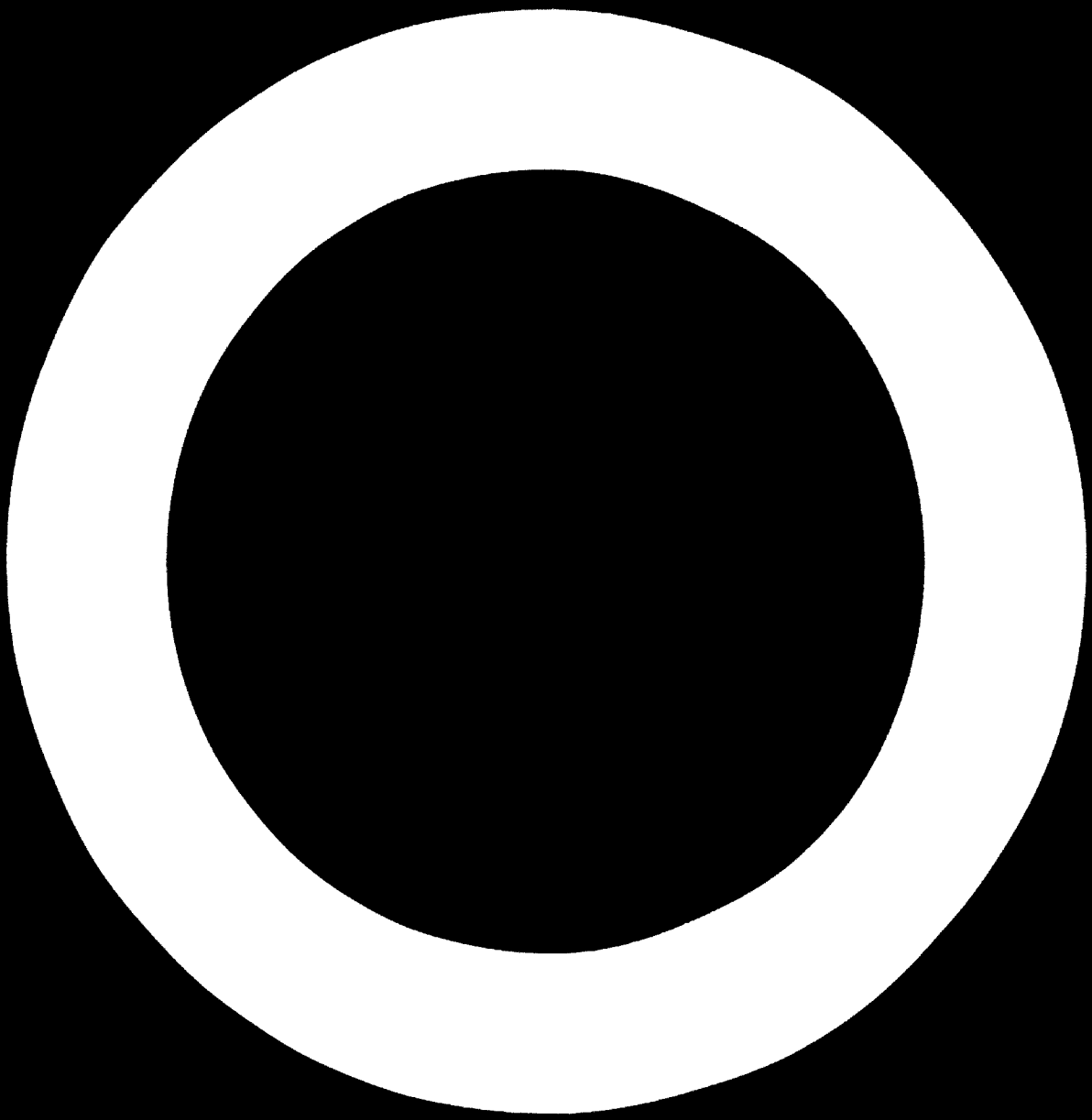
X. MAINTENANCE AND REPAIR

105. D. Parkes' paper entitled "Maintenance for woodworking plants" (ID/WG.151/7) was presented on the author's behalf by the UNIDO secretariat, together with the UNIDO paper entitled "Central maintenance and repair" (ID/WG.151/24) in which it was explained that the philosophy of maintenance was to increase profitability by increasing machine availability and extending working life. Two types of maintenance were defined: preventive maintenance, such as cleaning, inspection, lubrication and parts replacement; and maintenance prevention involving re-design of parts susceptible to failure.

106. P. Paavola presented A. Akkanen's paper entitled "The selection of maintenance equipment for woodworking plants" (ID/WG.151/15) in which he described a methodology for applying a maintenance programme, stressing careful preliminary preparation involving technical and circuit drawings, statistics and record sheets, as well as motivation of maintenance personnel.

107. In the discussion following the presentation, the Meeting noted that recent developments in component design were reducing the amount of maintenance required. It was considered that large stocks of spare parts might tend to discourage preventive maintenance in developing countries.

108. The desirability of tool-maintenance centres to cater for small plants was established. More teachers were clearly needed to train technicians in tool-maintenance practices, and this service could well be provided by international organizations and the technical assistance programmes set up by developed countries.



Annex I

AGENDA

1. Election of officers and adoption of agenda
2. Needs and conditions of the woodworking industry in developing countries
3. General selection guidelines (Problem identification, evaluation of alternatives and acceptance criteria)
4. Standardized classification and terminology
5. Woodworking machinery safety
6. Selection of equipment for various purposes
   - (a) Log breakdown
     - (i) Sawmilling
     - (ii) Veneer production
   - (b) Remanufacturing (resawing and planning)
   - (c) Machining (other operations)
   - (d) Miscellaneous operations
     - (i) Portable equipment and hand tools
     - (ii) Cutting tools: selection and maintenance
     - (iii) Dust control and waste extraction
     - (iv) Wood drying
     - (v) Wood preservation
   - (e) Quality control: laboratory and testing facilities
7. Maintenance and repair
8. Adoption of the report

Annex II

LIST OF DOCUMENTS[a/]

Symbol	Title
ID/WG.151/1	Provisional agenda and programme of work
ID/WG.151/2	List of documents
ID/WG.151/3 and Summary	Needs and conditions of the woodworking industries of the Philippines (document prepared by Mr. H. P. Brion, Sarmiento Industries, Cotabato, Philippines)
ID/WG.151/4 and Summary	Solar kilns: their suitability for developing countries (document prepared by Mr. R. A. Plumptre, Research Assistant, Commonwealth Forestry Institute, Oxford, United Kingdom)
ID/WG.151/5 and Corr.1 and Summary	Selection of finger jointing machines (document prepared by Mr. H. Syberts, Technical Manager, Hombak Maschinenfabrik, Bad Kreusnach, Federal Republic of Germany)
ID/WG.151/6 and Summary	General selection guidelines for woodworking machinery (document prepared by Mr. A. Travnik, Lignoprojekt, Bratislava, Czechoslovakia)
ID/WG.151/7 and Summary	Maintenance of woodworking plants (document prepared by Mr. D. Parkes, Maintenance Advisory Service, Witley, United Kingdom)
ID/WG.151/8 and Summary	Dust control and waste extraction (document prepared by Mr. A. Smith, Hitchin, Hertfordshire, United Kingdom)
ID/WG.151/9 and Summary	Safety and health in the design and use of woodworking machinery (document prepared by the Occupational Safety and Health Branch of The International Labour Office, Geneva, Switzerland)
ID/WG.151/10 and Summary	Needs and conditions of the woodworking industry in Guyana (document prepared by Mr. C F. Collins, Utilisation Officer, Forest Department, Georgetown, Guyana)

a/ A limited number of copies of these documents are available upon request in the language in which they were issued (English or French) as are summaries of the documents in English, French and Spanish.

ID/WG.151/11 and Summary	Needs and conditions of the wood processing industries in West Africa (document prepared by Mr. G. Noël, SCAC, Paris, France)
ID/WG.151/12 and Corr.1 and Summary	Selection of wood drying equipment (document prepared by Mr. A. Villière, Centre Technique du Bois, Paris, France)
ID/WG.151/13 and Summary	Selection and maintenance of outting tools for the woodworking industry (document prepared by Mr. S. A[illegible]al, President, North American Products Corporation, Jas[illegible], Indiana, United States of America)
ID/WG.151/14 and Summary	Standardised classification and terminology in the woodworking machinery industry (document prepared by Mr. H. Eldag, Consultant, Vienna, Austria)
ID/WG.151/15 and Summary	The selection of maintenance equipment for woodworking plants (document prepared by Mr. A. Akkanen, Lahden Rautateollisuus Oy, Lahti, Finland)
ID/WG.151/16 and Corr.1 and Summary	Multi-purpose machines and multi-purpose processing lines for the woodworking industry (document prepared by Mr. H. Eldag, Consultant, Vienna, Austria)
ID/WG.151/17 and Summary	Selection of machinery for remanufacturing: circular saws (document prepared by Mr. A. C. Mattison, Chairman of the Board and Treasurer, Mattison Machine Works, Rockford, Illinois, United States of America)
ID/WG.151/18 and Summary	Selection of equipment for joining (document prepared by Messrs. J. Reinhardt and E. van der Straeten, Plastics Division, Ciba-Geigy (UK) Limited, Cambridge, United Kingdom)
ID/WG.151/19 and Summary	The conditions and needs of the forest converting industries in West Malaysia, Papua New Guinea and Fiji (document prepared by Mr. M. Page, Forest Conversion Engineering Group, Division of Building Research, Commonwealth Scientific and Industrial Research Organisation, Melbourne, Australia)
ID/WG.151/20 and Corr.1 and Summary	Selection of nailing and stapling machines (document prepared by Mr. C. Reich, Bohm und Kruse Maschinenfabrik, Bremen, Federal Republic of Germany)
ID/WG.151/21 and Summary	Selection of planning and moulding machines for developing countries (document prepared by Mr. L. Wissing, Export Manager, Jonsereds Fabrikers AB, Jonsered, Sweden)
ID/WG.151/22 and Summary	Selection of equipment and preservatives for wood preservation (document prepared by Mr. V. R. Sonti, Chief Executive, Ascu Hickson Limited, Nagpur-1, India)
ID/WG.151/23 and Summary	Some economic and commerical factors determining the selection of woodworking machinery (document prepared by the ECE/FAO Timber Division, Geneva, Switzerland)

ID/WG.151/24 and Summary	Central maintenance and repair shops (document prepared by the secretariat of UNIDO)
ID/WG.151/25 and Corr.1 and Summary	Criteria for the acceptance and ascertainment of the technical standard of machine tools for woodworking operating by removal of chips or particles (document prepared by Mr. V. Radulescu, Consultant Engineer, Research and Design Institute for the Industrial Utilization of Wood, Bucharest, Romania)
ID/WG.151/26 and Summary	Wood, wood-based and woodworking machinery industries in India (document prepared by Mr. V. R. Sonti, Chief Executive, Ascu Hickson Limited, Nagpur-1, India)
ID/WG.151/27 and Add.1 and Summary	Selection of spreading and coating machines for the woodworking industries)document prepared by Mr. R. L. Koch II, President, Ashdee Division, George Koch Sons Incorporated, Evansville, Indiana, United States of America)
ID/WG.151/28 and Summary	Selection of equipment for log breakdown: band saws frame saws and chipper headrigs (document prepared by Mr. P. Imbery, Project Engineer, Gebrüder Linck, Oberkirch/Baden, Federal Republic of Germany)
ID/WG.151/29 and Summary	Selection of machinery for the production of veneer (document prepared by Mr. C. Massoneau, Valette et Garreau, Vichy, France)
ID/WG.151/30 and Summary	Quality control procedures and equipment for the secondary woodworking industries (document prepared by Messrs. E. Istodor-Berceanu and V. Platon, Institul de Cercetari, si Projectari Pentru, Industria Lemnuli, Bucharest, Romania)
ID/WG.151/31 and Summary	Selection of equipment for assembling wood structures and frames using metal connectors (document prepared by Mr. J. G. Stokes, Managing Director, Automated Building Components, Springvale, Victoria, Australia)
ID/WG.151/32 and Add.1 and Summary	Woodworking tool maintenance and selection of tool room equipment (document prepared by Mr. O. Stier, Vollmer Werke Maschinenfabrik, Biberach an der Riss, Federal Republic of Germany)
ID/WG.151/33 and Summary	Boring and mortising: technology and equipment (document prepared by Mr. H. Eldag, Consultant, Vienna, Austria)
ID/WG.151/34 Rev.1 and Summary	Selection of equipment for log breakdown using bandsaws (document prepared by Mr. G. Gillet, Compagnie William Gillet, Guillet, Rennepont, Bordeaux-Merignac, France)
ID/WG.151/35 and Summary	Sanding and polishing machinery (document prepared by Mr. H. Eldag, Consultant, Vienna, Austria)

ID/WG.151/36	List of participants
ID/WG.151/37*	Needs and conditions of the woodworking industries in developing countries: some points to consider (document prepared by the UNIDO secretariat)
ID/WG.151/38 Rev.1	Selection of woodworking machinery. Report of a technical meeting

*Originally issued as ITD/143/Rev.1

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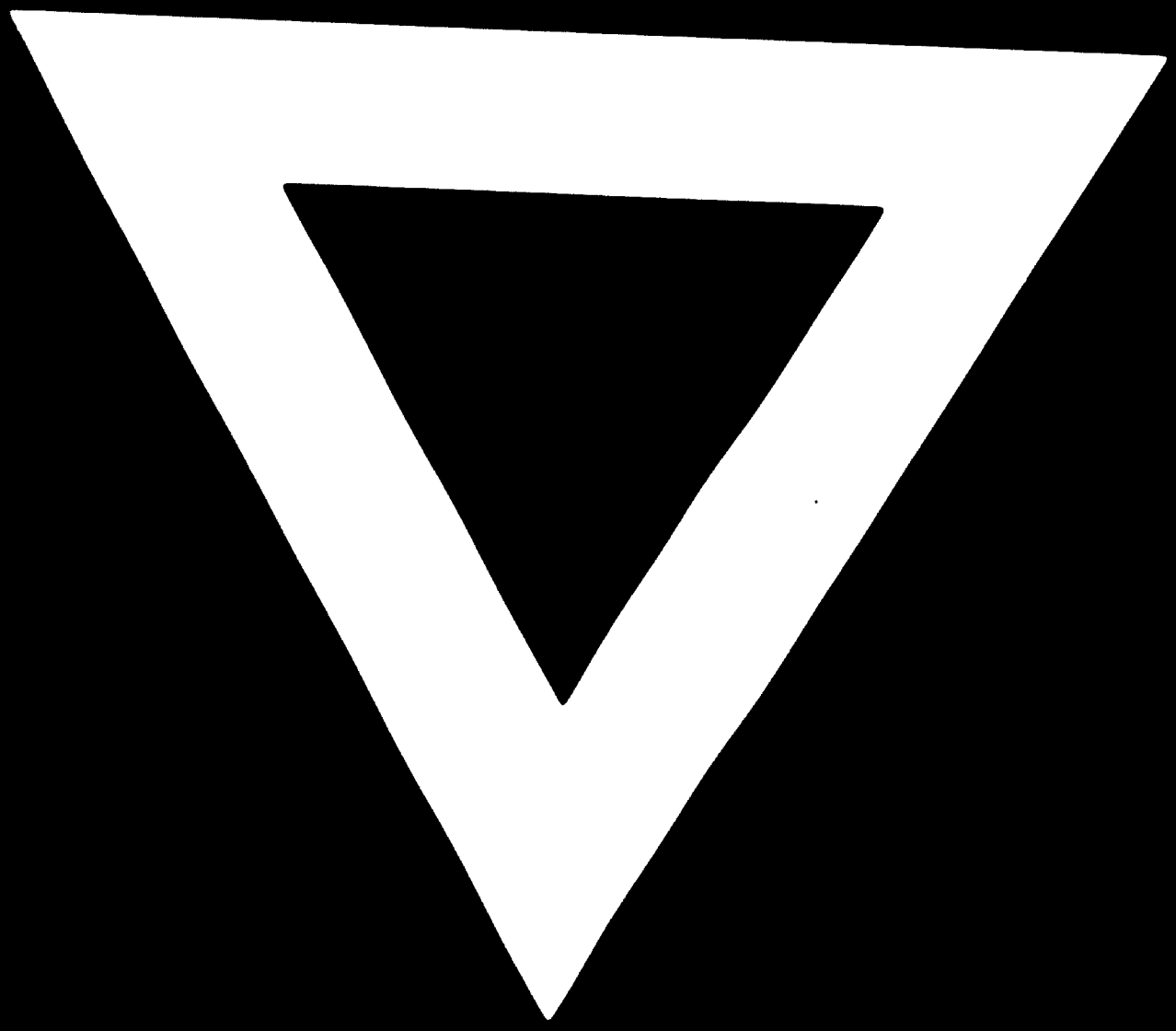

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