OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

18557

Distr.
RESTRICTED

IO/R.167
28 August 1990

ORIGINAL: ENGLISH

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

31 p.
+ annex

INTRA-REGIONAL COOPERATION IN DEVELOPMENT OF PLANTATION-BASED FOREST INDUSTRIES

DU/RAF/87/117

Technical Report: Timber Construction *

epared for the Preferential Trade Area for Eastern and Southern African States
(PTA)
by the United Nations Industrial Development Organization,
associated agency of the Food and Agriculture Organization
of the United Nations, which acted as executing agency for the
United Nations Development Programme

Based on the work of C.R. Francis
Timber Engineering Consultant*

Backstopping Officer: R.M. Hallett
Industrial Management and Rehabilitation Branch

United Nations Industrial Development Organization
Vienna

7/37

* This document has not been edited.

V.90-87345

TABLE OF CONTENTS

1. Introduction

This Report forms part of UNIDO activities in Project RAF/87/117. "Intra-Regional Cooperation in Development of Plantation Based Forest Industries" being executed by the FAO for the Preferential Trade Area (PTA) of Africa.

PTA members comprise:

A. Lesotho, Malawi, Swaziland, Zambia, Zimbabwe
B. Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda
C. Djibouti, Comoros, Somalia, Mauritius.

Madagascar is considering membership.

The expert was engaged by UNIDO mid-1989 to investigate the situation with respect to timber construction (see Annex 5 for Job Description) in appropriate countries. Countries visited included, in order of visit, Zambia, Zimbabwe, Swaziland, Malawi, Tanzania, Kenya, Ethiopia and Madagascar. The mission was combined with another for UNIDO's involving the preparation of a background report for the Second Consultation on Wood and Wood products. The fields surveyed were nearly identical with the same organizations and persons being interviewed.

The eight countries surveyed have many similarities. All have significant plantation forests, and in all of them the indigenous forest is more or less exhausted although varying quantities are still available. All countries except Ethiopia had their plantations established initially under colonial control and national staff have continued and extended the work started by the colonist.. Most of them have severe shortages of hard currency which hampers regional and foreign travel for marketing and training, purchase of adhesives and specialized hardware and particularly purchase of new machinery and spares for existing plants.

The problems throughout the region are also remarkably similar, differing only in degree and in local perception from country to country. This report therefore only mentions individual countries as examples, or where peculiar problems were observed.

This report concentrates on sawmilling and wood processing, panel manufacture and construction. Joinery and furniture manufacture are outside the range of the writer's primary expertise, but are touched on where appropriate.

Indigenous forests

When colonisation of the region began in the late 19th century there were considerable quantities of excellent quality timber available. This was distributed on climatic basis generally with softwoods (podocarpus, juniper, cedar) in cool moist uplands, hardwoods in warmer areas ranging in type from jungle in moist zones to open savannah forest. These were all widely exploited.

Because of ready availability of durable, stable clear timbers, often of great beauty, extremely high acceptance standards grew up. Also, because the region was fortunate in having several extremely durable species

construction practices which would not be tolerated in less fortunate parts of the world came to be accepted as the norm. This refers particularly to moisture entry details in construction which could be ignored when such durable wood was readily available, and also to the use of excessively heavy members which was hardly a problem when wood and labour were cheap.

Through most of the region these indigenous forests are nearly exhausted, and even where vestiges remain these are generally in inaccessible areas. Nevertheless, supplies of indigenous timbers are still available. Even where conservation measures are enforced there is often considerable illegal felling and conversion.

A result of this early availability of top quality timbers is that the standards applied to them are transferred to the plantation pines and eucalyptus species which have succeeded them as the wood resource, and of course the plantation species suffer badly in a one to one comparison. Indeed, much of the value of "valuable" species lies in the fact that careful processing, grading and skill in use is unnecessary. A species which requires preservative treatment, careful drying, stress grading and skilled carpentry techniques to match the performance of a "valuable" species is dismissed in the popular mind as worthless.

This is not a phenomonen which is unique to the region. All timber using countries have gone or will go through the same process. The only difference is in time scale. The problems facing the region in utilizing their plantations are not new and there is a wealth of similar experience available for them to draw on.

PLANTATIONS

The demise of indigenous forests was forseen throughout the region at different times. In Ethiopia it was the Emperor Menelik who introduced exotic Eucalyptus species last century to provide a wood supply. In Ethiopia nowadays it is almost forgotten that this is an exotic species. In other countries notably Kenya and Madagascar, eucalyptus were planted to supply railway locomotive fuel.

Since the passing of the steam engine these plantations are now largely used for domestic fuel. In Zambia, eucalyptus were planted to supply mining timbers but since the end of the copper boom this wood is available for other uses.

Pine plantations were established in the region at varying times in the past, up to 50 years ago in some cases. The most successful species appear to be P. palustris, P. caribaea and P. kheysia. P. radiata while showing excellent growth rates proved too disease-prone in Kenya. Small volumes of other pinus species are occasionally found. Generally the wood properties of all these species are quite similar and it is not necessary to distinguish between them. Thus all pine species in Zambia are marketed simply as "Zambia pine".[1]

---

[1] This is similar to the practice in Mexico where all domestic pines are classified structurally together unless a single mill identifies a certain species and markets it separately.

In several countries extensive pine plantations were established for pulpwood. However, in Malawi, the proposed mill could not be financed and a large plantation resource remained unused. This had not been tended silviculturally for sawlog production and its utilization remains a problem.

2. Construction and Engineering

Use of timber in construction has remained static and no innovations have been observed in use patterns. In major buildings, use is confined to rough shutterring and internal joinery. No plywood formwork was observed on any major buildings in progress. This is due to the general lack of availability of exterior plywood adhesives, in turn due to general shortage of hard currency for imports.

Timber use in domestic construction generally remains confined to roofs and joinery and the situation outlined in the earlier report "Increasing Timber Construction in Africa" [2] remains unchanged. Several interviews with officers of national housing authorities (Malawi, Swaziland, Zimbabwe) showed considerable resistance to the concept of all-timber houses. On the other hand there is some enthusiasm in official quarters in Kenya, Madagascar and Tanzania for timber housing.

There are several companies manufacturing prefabricated timber housing in Kenya and Tanzania. One firm in Kenya reported considerable export sales, but only for construction projects where a lot of staff housing was required quickly.

There is considerably more required in the construction of timber housing than just a supply of suitable timber. On the human resources side, are required designers used to working in timber housing and builders who can organize the various trades involved. The tradesmen needed are not only skilled framing and finishing carpenters, but also electricians and plumbers familiar with appropriate techniques, who will not damage the structure when making their installations.

Many materials associated with timber construction are not available in Africa. There include galvanised nails and screws, panel pins, coach screws and coach bolts. Other major materials, which are note available, depending somewhat on the type of construction adopted, include incombustible lining panels, stopping materials for these, breather type building paper, construction plywood, folded punched metal bracing, window and door surround joinery, finishing mouldings, and appropriate electrical hardware. This is a rather daunting list.

The writer does not think that building one or two demonstration houses can be of much use in introducing this technology. Procurement problems for small quantities of non-available items such as those listed above would be such as to require an inordinate amount of work or more likely unsuitable available items would be used with consequent lowering of quality standards. Also, local carpenters would still be learning the techniques involved and quality and production rates would be low.

---

[2] ID/SER.A/805.

The writer suggest that a demonstration estate of at least 20, preferably 30 or 40 houses should be built. This size is beyond the funding scope of an agency concerned with technology transfer. Therefore cooperation should be sought with an infrastructure project - education or health - which includes provision of staff housing. These need not all be on a single site and groups of eight or ten houses per location would be satisfactory.

A project of this size would warrant bulk importation of locally unavailable materials and the engagement of skilled expatriates to train national professionals and workmen. Other advantages of scale include:

- Reliable cost date once a reasonable point on the learning curve has been achieved.
- In-depth training of national staff.
- Achievement of higher quality than is possible in a single prototype.
- A large data base for observation by local lending and regulatory authorities.
- A number of educated people (teachers, nurses, etc.) with experience of inhabiting wooden houses, who can communicate their experiences.

The writer considers that such a project should not be aimed at the "low cost" sector. Timber is not a particularly cheap material. Low cost construction in timber can only result in low quality, as in any other traditional material. Its advantages lie in his light weight with consequent low transport costs, and its ease of working and quick erection. These can only be demonstrated if a fairly large volume is involved. People will take note of a prestige project but will ignore a slum clearance project.

Most countries in the Region have utility pole manufacturing industries. These produce pressure creosoted poles from eucalyptus species. Creosoted poles tend to self extinguish. One plant in Zambia is installing a double pressure process plant i.e. creosote followed by CCA.

A few large sales of poles between countries have been reported. Use of treated poles for building purposes appeared minimal. The exceptions were in a very few sawmills.

Lack of roads and bridges remains a major restriction to development in most of the region. A constraint in bridge construction is the requirement for hard currency to purchase reinforcing steel and cement for bridge foundation. Many of the larger electricity poles seen would have made excellent foundation piles, and the use of gabions could also save on costs.

Discussions with engineers in several public works ministries revealed considerable interest in the idea of using timber piles for bridge piers. The main reason offered for them not being used was that it had never been thought of. Expatriate aid engineers were Europeans with no experience of timber bridge construction on major works.

As a result of the interest displayed, a Technical Report "Timber Pile Construction" has been prepared[1]. This is available to Governments in the region.

An interesting use of timber in engineering structures was observed in Iringa, Tanzania. Here the Ministry of Water Supply is using timber stave pipelines (600 mm diameter) for irrigation water supply and timber stave tanks for storage. The timber is CCA treated pine from the nearby Sao Hills sawmill. Reasons quoted for use were the high local cost content compared with any other form of pipe or tank.

Stave pipes and tanks are generally uneconomical in developed countries because of the high labour content, although large numbers still exist, particularly in the USA and examples have been seen elsewhere. Their use in regions of readily available wood and low labour costs is entirely appropriate.

3. Training

It was generally acknowledged that there is a major requirement for training at all levels in the timber producing and consuming industries. Major deficiencies quoted to the expert at the various levels were:

- Management. Need for further training in
  - . Alternative sawing and processing techniques
  - . Marketing
  - . Scheduled and preventive maintenance
  - . Production planning and costing

- Workmen
  - . Sawdoctoring
  - . Knife sharpening
  - . Machine setting and operting
  - . Grading
  - . Kiln operation

- Consumers
  - . Timber design and utilization
  - . Use of plantation species
  - . Use of plywood and particle board.

Discussing these in turn, it appears that the training problems in management are largely a consequence of the general shortage of foreign currency which inhibits travel even within Africa and also severely restricts the importations of trade and technical journals. Senior managers are certainly aware of their shortcomings in the fields mentioned and are frustrated in their efforts to do anything about it. They must therefore rely heavily on foreign advisers, who naturally bring their own familiar techniques with them which may or may not be the most appropriate. Thus, for example, we find Europeans advising on the sawing and processing of eucalyptus, when one would imagine Australians to have a better expertise in this field.

---

[1] IO/R.168

The only way to ameliorate this situation would appear to be more availability of foreign currency for travel and purchase of journals, or to bring more specialized consultants in direct contact with industry.

The low standards of machinery maintenance in the region has been the subject of unfavourable comment on numerous occasions, and not only in the timber industry. Certainly much of this is caused by non-availability of spare parts and scarcity of skilled maintenance tradesmen. All the same many breakdowns could be avoided if continuous preventive maintenance were carried out.

It is recommended that this could be the subject of a training course for appropriate middle level managers. This would include production managers of sawmills, panel plants and furniture and joinery factories. A residential course of one week would be appropriate. Details of the course would require planning by an expert mechanical engineer.

Active marketing of timber and timber products is almost unknown in the region. During his stay in the region the expert saw no television advertisements for timber or timber products. This contrasts strongly with the situation in developed timber using countries.

The writer is not a marketing expert but it is apparent that a need for more knowledge of marketing techniques exists and this is acknowledged by many senior managers. Whether marketing should be taught by seminars or other means should be decided by a marketing expert.

The lack of knowledge of sound methods of production planning and costing was raised by several executives in various countries. This subject has been covered several times in the various UNIDO training courses for the furniture and joinery industries run in Finland over past years, but it is apparent that more effort is required in this field in the region. One or more intensive one or two week courses held in the region appear to be warranted. Several venues are possible: - Mutare, Zimbabwe; Moshi, Tanzania or N'Kuru, Kenya all have suitable factibilities.

Workmen's skills are also in need of upgrading. General trade skills-mechanics, electricians etc. are adequately trained at polytechnics in most cases although as in most developing countries the demand far exceeds the output of these colleges. However, specialized industry training is almost completely done on the job and the results of this range from barely adequate to almost zero. The deciding factor seems to be the capability and teaching ability of the senior tradesman at each plant. A fairly common factor is that the senior tradesman was instructed on the job by expatriate experts when the plant was installed or occasionally sent to an overseas training facility. Since then he has been left to his own devices with little or no checks that he has maintained his original skill level or has not allowed bad practices to creep in. It is rare for managers to be skilled in these esoteric trades and consequently managers are generally unliky to monitor the absolute performance of skilled tradesman. They may be aware of low quality or low productivity in various processes but are unable to pinpoint exact reasons.

There are needs for retraining of silled workmen in the skills of:

. Sawdoctoring
. Knife sharpening

. Machine setting and operating
. Kiln operating
. Grading.

Sawdoctoring and knife sharpening teaching facilities exist at the Wood Utilization and Research Division of the Ministry of Agriculture, Addis Ababa. The Director of WUAR has indicated his willingness to host courses. Because of the size of the facility course numbers should be limited to 8 students at a time.

It is recommended that refresher training courses in sawdoctoring, knife sharpening and machine setting should be arranged between UNIDO and WUAR for skilled tradesmen in these fields. A criterion for selection should be that the trainer is in a position to pass on his skills to others in his own country either by visiting other plants or by having tradesmen from small plants come and work for a while under his supervision.

The situation with respect to grading is more complicated. There are various species of pine grown in the region, admittedly all quite similar but still having individual characteristics. Eucalyptus and cypress also form significant proportions of the timber available in some countries of the Region. Then there are the variety of grading rules in use or in some cases disregarded.

The southern countries, Malawi, Swaziland, Zambia and Zimbabwe with export or technical links with South Africa use the South African visual or mechanical stress grading rules for pine. The grading standards and training of graders in these export fields are adequately maintained by export market forces and by training in South Africa.

Further north in Tanzania, Kenya and Ethiopia and also in the domestic markets of the Southern states there is no market incentive to grade. Thus even where grading rules exist it is difficult or impossible to buy graded timber. On a small scale, selection is practised by customers at the timber yard and haggling resorted to in the case of low quality sticks. This situation appears likely to continue until timber becames much more widely used in construction and quality standards are demanded by mortgagors.

At this stage it is suggested that training in grading would be unprofitable. When the market situation requires it, senior officers from the appropriate Government Departments or Corporations should attend a course run in a developed country where warm climate pines and eucalyptus species are widely used to learn techniques of grading appropriate for their own countries.

Consumer awareness of potential use of local plantation timbers, their advantages and limitations is very small. This is largely a consequence of the very small marketing efforts which have been made by the industry. In developed timber using countries, besides advertisements there is generally a range of technical and informative literature freely available from the industry, and books and manuals available at subsidized prices.

An example of each of these is shown in Appendices 1 and 2.

There is some interest in timber engineering in the Region, notably in Kenya and Zimbabwe. Both of these countries teach courses in timber

structures at their engineering schools. This is highly commendable, but it will be some time before recent graduates and undergraduates gain seniority and have the power to influence structural thinking.

Arrangements are in hand to organize a two week seminar on timber engineering at the University of Harare, Zimbabwe. The school of engineering there has a new well-equipped timber structures laboratory. It is proposed that the course should be aimed at qualified structural engineers from both Government and private sectors who are engaged in designing and specifying building works. A draft course curriculum is shown in Appendix 3.

4. Preservation

All countries in the Region have wood proservation facilities to a greater or lesser extent. The major use is for eucalyptus utility poles. In the Southern part of the Region creosote is the favoured preservative, but CCA [4] is more widely used in Tanzania and Kenya. Ethiopia has only a pilot scale facility. Creosote is favoured over CCA for poles because it performs better in grass fires. CCA treated poles tend to continue to smoulder even in the absence of external fuel whereas creosoted poles self-extinguish.

Because of the relatively low use of timber construction there is correspondingly a small volume demand for treated building timber. Of the waterborne salts, CCA is used almost exclusively. However, one housing company in Kenya uses boron-fluoride-chrome-arsenic dip diffusion for all the timber in its houses.

The major hazard above ground is termite attack from subterranean termites in joinery and fitments, and dry-wood termites in roof structures. While boron has a deterrant effect on many termites, it is not completely effective. Arsenic formulations will continue to be the main waterborne salts used in the forseeable future. Because of their applicability to both interior and exterior environments and consequent lack of complications at a treatment plant, CCA will continue to be the major waterborne treatment salt.

Although dominated by creosote for exterior use, there is still a substantial tonnage of CCA used in the Region. This is all imported from overseas.

The three active elements, copper, chromium and arsenic are all mined in the Region, the first two in substantial tonnages, and arsenic is recovered as a by-product of smelting various ores. Formulation of CCA salts is not difficult, particularly if a wet formulation rather than a powder is manufactured. Round figure quantities required for a typical mixture of 1,000 tonnes dry salt formulation are:

Copper sulphate $Cu\ SO_4 . 5H_2O$ = 400 tons
Sodium dichromate $Na_2Cr_2O_7 . 2H_2O$ = 400 tons
Arsenic pentoxide $AS_2 . O_5$ = 250 tons

The expert recommends that a postal survey should be undertaken to determine the annual consumption of CCA salts in the Region and also in neighbouring states which may not be members of the PTA. This should include

---

[4] CCA: Copper - Chrome - Arsenic Salts.

price and customs details. At the same time information should be sought in Zambia and Zimbabwe on the availability and cost of the three raw materials.

This should give the basic input for a pre-investment feasibility study on local manufacture of CCA salts. There is some manufacturing know-how involved and the services of an industrial chemist would be required for a few months to set up a plant.

5. Adhesives

It appears that a major inhibiting factor to the much wider use of plywood (and to a lesser degree particle board) in Africa is the absence of exterior quality adhesives. Two problems are apparent. Since the introduction of plywood manufacture, only interior quality adhesives have ever been used, and when plywood has been exposed outside it fell apart. The general perception of plywood is therefore, quite naturally, as a non-durable product. Secondly exterior adhesives are not manufactured in Africa. Chemical exterior adhesives are petro-chemicals and require hard currency for purchase.

Technology has been developed to manufacture exterior quality adhesives from bark extracts. The writer is not an expert in this subject, but has observed progress in his own country and as reported in technical journals.

One firm in Kenya has appointed a polymer chemist to study and manufacture tannin-based plywood adhesives. This is highly commandable. The firm acknowledges that they are starting from scratch and that the chemist is a novice.

The writer considers this to be a major step forward for the region. It is likely that wattle bark extract will be the source of natural tannins. Wattle has been widely planted in Africa to the extent that in many areas it has become a weed. The writer has suggested that this company should request UNIDO expert assistance once their chemist has established his laboratory so that the experience gained in Kenya on this work can be shared with other PTA countries.

Steps have been taken to initiate this work.

6. Boats

A major problem in much of littoral Africa, as in many other developing countries, is the shortage of suitable tree trunks for dugout canoe making. Dugout canoes are the major item of equipment for thousands of artisanal level fishermen. They are not very durable, being generally composed of decay-prone sapwood and need replacing every five years or so.

Felling of indigenous forests has resulted in an almost complete absence of logs suitable for dugout manufacture. Ways of life are being threatened and malnutrition (biri-biri) caused by protein deficiency is appearing amongst people who have traditionally lived by fishing from dugout canoes which can no longer be replaced.

Many countries in the Region have plywood industries which produce good quality plywood. Plywood is a favoured boat building material in developed countries although its popularity has been overtaken in recent years by fibre

glass, mainly due to the absence of maintenance requirements of the latter. Even so there must be hundreds of thousands of plywood boats of all sizes up to about 10 m in developed countries.

Plywood has not been used for any sort of work boat in the region. Recently UNIDO implemented a successful wooden boat building project in Indonesia which included the manufacture of plywood canoes and fishing boats as replacements for traditional dugouts. Problems which were encountered and overcome included:

1. Plywood quality. Marine quality (phenol or phenol/resorcinol) adhesive is necessary for the plywood manufacture. Interior quality (urea) adhesive is not suitable. Marine quality adhesive is considerably more expensive than interior quality resin, and must be imported from hard currency sources.

2. Acceptance of the new canoes had to be gained from the naturally conservative fishermen.

3. Financing arrangements had to be instituted. Dugout canoes are in most cases locally produced and if a boatbuilder is involved his payment may be made largely in kind rather than in cash.

The project reportedly had few problems in teaching workmen the techniques of plywood boat building. Not only were complete canoes produced but also kitsets for assembly in distant islands of the archipelago.

Other plywood fishing boat designs have been promoted by bilateral aid agencies based on the dory used off Newfoundland with considerable success in several African countries. Also several hundred of another design have been built by boatyards in South India. (See Annex ... for a summary statement about the dories.) Designs generally exist in developed countries and only some adaptations or modifications would be needed to suit local or regional conditions, tastes and materials available.

Interest was expressed in several plywood mills and also by several fisheries officers in various countries. In Tanzania there is a boat building section of the Fisheries Department. This concentrates on larger salt water boats in traditional indigenous wooden construction, but the chief boat building officer agreed that the idea was very attractive and could solve major problems on Lakes Tanganyika and Victoria. Tanzania has at least six boat building yards, both inland and marine including one training school. Interest was also expressed in Ethiopia, Malawi and Zambia.

Further investigations are necessary before a project proposal could be implemented.

7. Summary and Recommendations

7.1. Construction and Engineering

(1) In association with a major funding agency which is financing a project which includes a housing estate UNIDO should seek to have this constructed in timber. This could possibly be done in conjunction with an agency more directly concerned with training, like ILO or with a bilateral aid agency of a country with a strong tradition of site built timber houses, to provide

skilled supervisory tradesmen. The size of the estate should be as large as possible, at least twenty but preferably forty or fifty houses in order to give extended and in-depth training to national tradesmen, to generate significant publicity, and to generate interest among local hardware and building suppliers manufacturers and importers.

(ii) In order to increase consumption of treated poles, and to decrease importation of steel and cement, UNIDO should promote the use of timber piles for bridge construction.

The superstructure need not be the UNIDO modular prefabricated bridge. Any sort of superstructure may be founded on timber piles including steel or concrete beams, composite timber-concrete plates, etc. As to a starting point the recently prepared UNIDO manual on timber pile construction should be distributed among UNIDO Country Directors (UCD) for discussion with national highway and railway bridge engineers.

(iii) Contact should be made with the Ministry of Water Supply, Tanzania, to publicize the stave pipe irrigation systems being piloted at Iringa.

7.2. Training

(i) There is a major need for training in all subjects at all levels. UNIDO should sponsor a series of training workshops in subjects such as:

- Sawdoctoring
- Knife sharpening
- Machine setting and operating
- Preservation plant operating
- Kiln operation.

Assistance with costs, and provision of lecturers should be sought from equipment and materials suppliers. These workshops should be for senior workmen who can be expected in turn to train those under them, and preferably from larger operations where the participants can rotate among several mills or plants.

(ii) A course or courses should be arranged for middle level managers to study preventative maintenance.

(iii) Continuing effort is required in training in marketing as has been done in the fields of furniture and joinery.

(iv) A two week residential course in timber engineering should be arranged at the University of Zimbabwe Engineering School at Harare. A proposed course programme is given in Appendix 3.

7.3. Preservation

Recommendations concerning plant operator training have already been made.

Timber treaters in the region should be encouraged to disseminate among the public the advantages of preservative treated timber. This must be by local effort, but every encouragement should be given by UN staff of all agencies associated with timber utilization.

A potential appears to exist for African formulated CCA salts. It is recommended that steps should be taken to explore this by:

1. a postal survey of consumption
2. inquiries as to cost of locally available metallic salts of copper, chromium and arsenic
3. a feasibility study of the establishment of a CCA manufacturing plant within the PTA region, using PTA sourced raw materials.

7.4. Adhesives

It is recommended that a UNIDO expert should be attached to a board manufacturing plant in order to establish the use of water and boil proof (WBP) quality adhesives based on African tannin. This should be for a sufficient period, and engage appropriate chemical and engineering expertise to:

1. determine formulations for plywood and particle board adhesives
2. determine total regional demand and prices
3. complete a pre-investment feasibility study for the establishment of a manufacturing unit

The project should continue to support a manufacturing unit, should this be determined to be economic.

Possible tannin sources, all widely available are the barks of wattle, pine and mangrove.

7.5. Boats

A project should be established to construct plywood replacements for dugout canoes, using African plywood made with WBP tanin based adhesive. A precedent exists in the successful UNIDO project carried out in Indonesia. From the information gained, Tanzania seems to be the best placed country to carry out this work, but another possibility is Malawi. The project should include the production of flatpacked kitsets for export and assembly in other countries bordering on the Great Lakes.

New Zealand TIMBER TODAY

VOLUME 15 • NUMBER 1 • JUNE 1990

INCORPORATING THE NEW ZEALAND JOURNAL OF

TIMBER CONSTRUCTION

NZTIF

THE NEW ZEALAND JOURNAL OF

TIMBER CONSTRUCTION

VOLUME 6/NO. 1 FEBRUARY 1988

OFFICIAL JOURNAL OF THE NZ TIMBER DESIGN SOCIETY

The Society is a Technical Group of the Institution of Professional Engineers New Zealand.
PO Box 12241, WELLINGTON

Membership of the Society is open to professional engineers, architects, scientists, builders and others interested in the design of timber structures.

The New Zealand Journal of Timber Construction is published quarterly by New Zealand Timber Industry Marketing Ltd in conjunction with the New Zealand Timber Design Society.

Technical Editor: Hank Bier
Production Editor: Beverley Underwood
Design and Finished Art: Kurt Buri Limited
Typesetting: TypeHouse
Printing: Hillary Court Print Ltd

All correspondence, subscriptions and advertising queries should be addressed to:

The Editor
New Zealand Journal of Timber Construction
PO Box 308
WELLINGTON

CONTENTS

EXAMPLES OF DESIGN AIDS

tested STRUCTURAL PAA PLYWOOD

STRUCTURAL PLYWOOD WALL BRACING

DESIGN MANUAL

INTRODUCTION

The objective of this manual is to provide designers of low rise, domestic or similar framed structures with allowable racking and hold-down resistances for a range of structural plywood sheathed timber framed wall systems. These values then may be used by designers to economically overcome the horizontal and vertical forces to which a building is subjected in high or cyclonic winds.

The manual covers the forces that are applied to buildings for the design wind speeds appropriate to 6m eaves height for building sites designated Terrain Categories 1, 2 and 3 in cyclonic and non-cyclonic areas. The wind speeds are based on AS 1170 Loading Code Part 2 — Wind Forces.

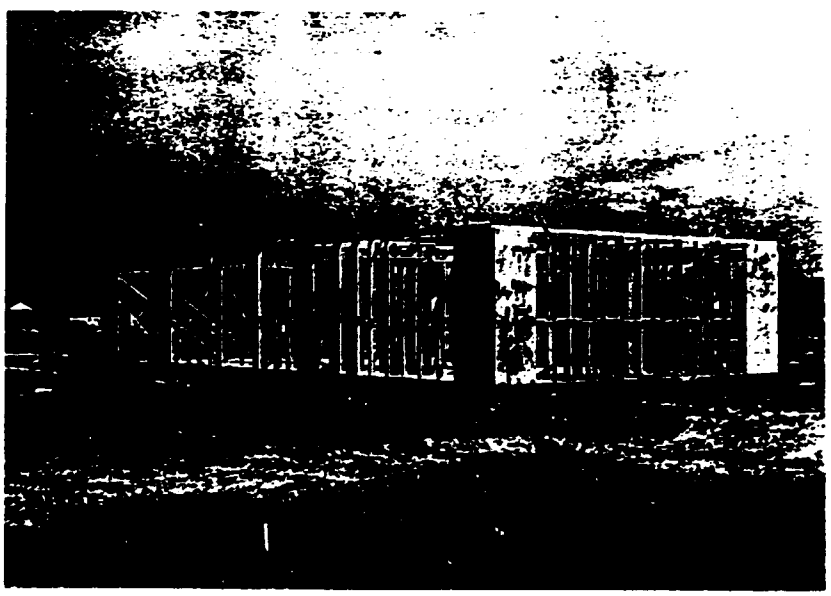
Actual design values are given for the racking and hold-down resistance of a range of timber framed, plywood sheathed wall systems. The manual can be used to design plywood bracing into buildings exposed to any wind speed.

Data on the use of structural plywood shear walls to provide racking and hold-down resistance in timber framed dwellings was published first by the Plywood Association of Australia in 1973. All subsequent specifications have been directed specifically at the builder. This manual is directed at designers as well as builders and takes into account the results of the great deal of additional testing of plywood sheathed walls that has occurred since 1973.

The objective of the additional testing was to optimise the use of structural plywood wall sheathing. It is believed that through full scale prototype test programmes at independant laboratories such as CIAE in Rockhampton, QIT and CSIRO a great degree of optimisation has occurred resulting in cost benefits to the building industry.

Some structural plywood thicknesses relative to stress grade and stud spacing have been reduced significantly in this manual when compared to previous PAA literature as a result of this optimisation. The new values are safe as they result from testing full scale wall panels by the above authorities. The design loads are verified by engineered computations underwritten by the Plywood Association of Australia.

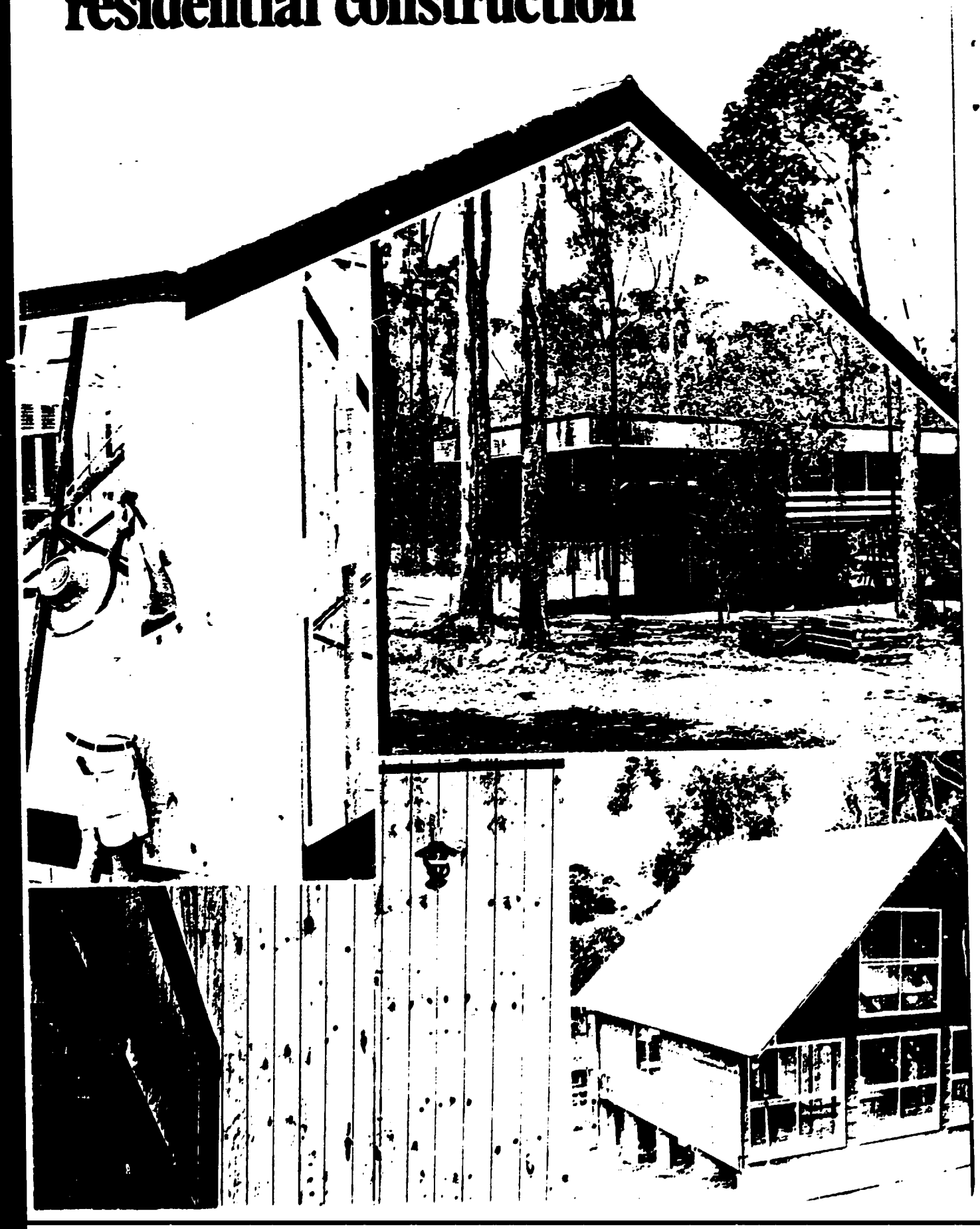
The manual follows closely the approach to bracing taken in Appendix 4 to the Standard Building By-Laws of Queensland. The manual will provide engineers, architects, draftsmen and builders with useful data to design dwellings with structural integrity at minimum cost.



Partially Plywood Sheathed Frame has Designed Racking Resistance

Full Plywood Sheathing Provides both Uplift and Racking Resistance to the Frame

Plywood in residential construction



PLYWOOD IN RESIDENTIAL CONSTRUCTION

TABLE OF CONTENTS

CI/SfB
(23) Ri4
April 1990

CHH PLYWOOD FLOORING

PRODUCT AND INSTALLATION INFORMATION

INTRODUCTION

CHH Floorply is exterior structural plywood suitable for residential, commercial and industrial applications.

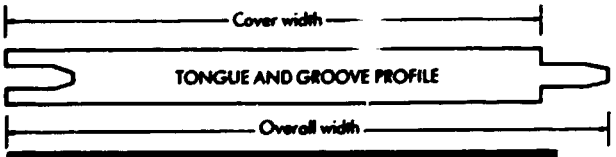
Floorply has a tongue and groove edge profile, is light and easy to handle, quick to lay, eliminates bogging and provides a working platform.

PRODUCT DATA

Sheet length (mm) : 2400
Width — overall (mm) : 1209
— cover (mm) : 1200

Thicknesses (mm)	12.5	15.0	17.5	21.0
Weight kg/sheet	19	24	28	34

Species : Pinus radiata
Adhesive : Phenol formaldehyde (waterproof)
Grades : B-D, Cp-D
Treatment : H3 preservative treated (if required)
Manufacturing Standard : NZS 3614:1971
Appearance : Floorply is not recommended for clear finished decorative floors.
Edge Profile : Tongue and Groove long edges



PLYWOOD THICKNESS AND JOIST SPACING

For floors with uniform distributed loads not exceeding 3kPa and concentrated loads not exceeding 1.8kN.

Plywood Thickness (mm)	Maximum Joist Spacing (mm)
12.5	400
15.0	480
17.5	600
21.0	800

STORAGE

Stack Floorply clear of the ground on evenly spaced bearers. If stored outdoors, the product should be protected from the weather.

PRELIMINARY CONSIDERATIONS

1. CHOICE OF FIXING METHOD
Floorply may be nailed, or glued and nailed to joists. The latter method is recommended to maximise floor performance.

2. FLOOR FRAMING
Floorply must be installed with the face grain spanning across the joists, with the non-tongue and grooved sheet ends supported by joists.

The joists must be spaced on a module of the 2400mm sheet length and this spacing should not exceed the maximum set out in the table.

Allow for 2mm gap at sheet ends when setting out joists.

The tongue and groove joints between sheets do not require support. Where specified by the building code strutting between joists should preferably be of the herringbone or diagonal type.

To provide restaint for the floor joists and to support the floor under exterior wall plates, the ends of the joists should be terminated at the boundary or trimmer joists.

3. NAIL SIZES

Plywood Thickness (mm)	Minimum Nail Size (mm)
12.5	50 x 2.5
15.0	55 x 2.8
17.5	60 x 2.8
21.0	60 x 2.8

Notes:

a) Galvanised nails should be used where rust staining could be unsightly or where there is likelihood of continued dampness.

b) Deformed shank nails are recommended for their withdrawal resistance properties.

4. ADHESIVES
Fuller's, Bostik and Ados construction adhesives are recommended for gluing Floorply to joists. Other water based construction adhesives may also be suitable. Check the manufacturer's recommendations.

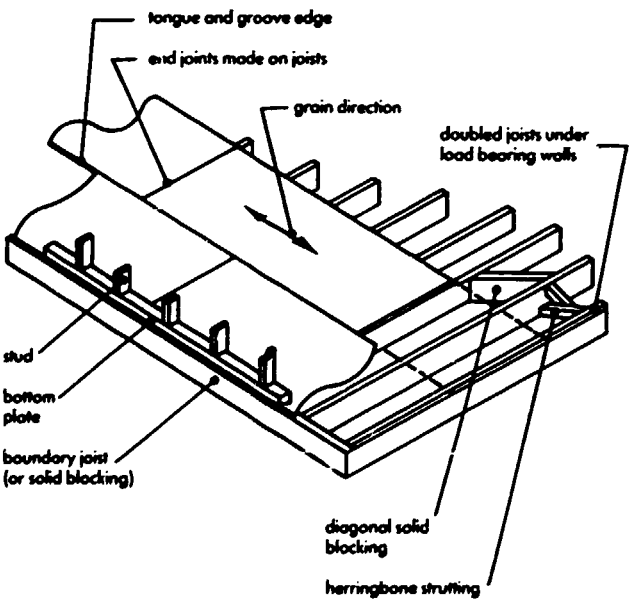
5. PRELAYING
As the veneers are bonded with a waterproof adhesive, Floorply is particularly suitable for prelaying. However, as extended weathering may cause swelling it is advisable to close the building in as soon as practicable.

FIXING INSTRUCTIONS

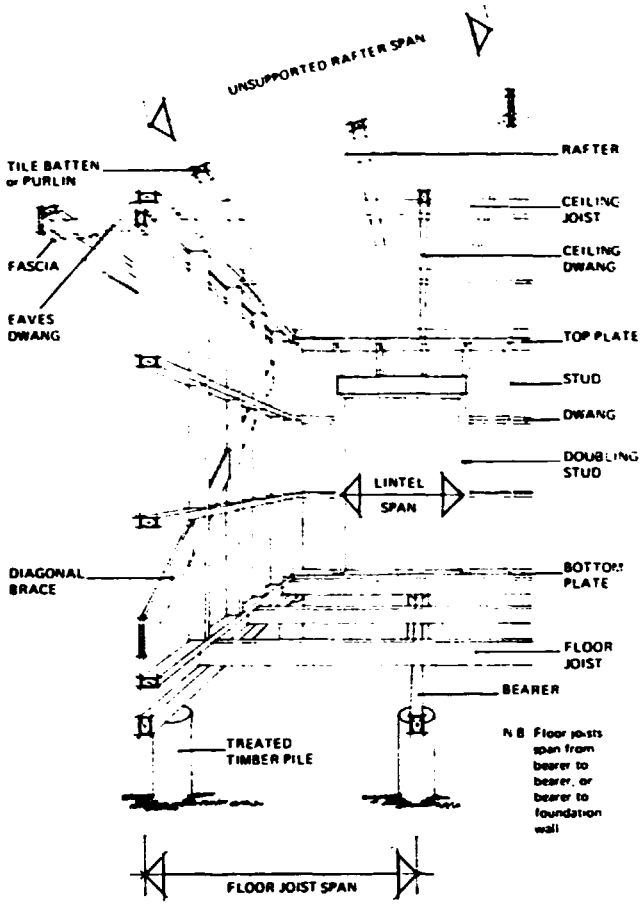
(Alternate instructions for glued and nailed floors in brackets.)

1. Clean all mud, dirt and free water from tops of joists.
2. Snap a chalk line one sheet width out from the edge of the floor. This will serve as an alignment guide for the first row of sheets.
3. (Apply 5mm diameter bead of construction adhesive to the joists. Joists under panel end joints should receive two beads of adhesive — one for each sheet. Glue should be applied to permit the laying of one sheet at a time.)
4. Place first row of Floorply with the tongue side of the sheets at the floor edge. This procedure will protect the tongues of subsequently installed sheets. The branded face of the sheets should be placed to the underside. Leave a 2mm gap at end joints and around floor perimeter if it is being fitted inside walls.
5. Fix Floorply with the recommended nails. Space fixings at 150mm centres on sheet ends and at 300mm centres on intermediate joists. (For glued and nailed floors, fixings may be 300mm on all joists.)

   For ease of fitting, the row of nails along the grooved sheet edge should not be driven home until the adjoining sheets have been set in place.
6. Lay the second and subsequent rows of sheets. Start alternate rows with a part sheet so that a 'brick-bond' pattern of staggered end joints can be achieved. Under normal conditions the tongue and groove joints can be 'jiggled' into place by hand for a firm fit. If necessary a heavy hammer can be used to drive the sheets home, but ensure the sheet edges are protected by a long straight piece of wood.
   CAUTION: Do not use 'cramps'.
   Leave a 2mm gap at sheet ends.
7. Just before the floor coverings are applied all nailheads should be punched below the panel face. This will help take up some of the shrinkage in the joists. Do not fill the nail holes. (This step is not required for glued floors to be covered with thick resilient coverings.)
8. Where thin floor coverings, such as vinyl, are to be applied the floor should finally be given a light sanding to remove dirt and even-up any joint irregularities.



SPAN CALCULATOR



T.P.A. SPECIFICATIONS

Comm Spec.	Brand *	End Use or Location
C1	C1	Marine Piles & Timber in Contact with sea water Rounds & Part Rounds
C2	C2	Transmission Poles
C2B	C2B	Poles and Piles for Housing Construction (Pines only)
C3	C3	Posts & Sawn Timbers for use in ground contact poles for barns and similar agricultural uses.
C4	C4	Sawn Posts and Timbers in ground contact for domestic fencing (Pines only)
C5	C5	Fence palings, battens, droppers
C6	C6	Sawn timber for exterior joinery (Radiata Pine only)
C6B	C6	Exterior Joinery continuously protected from the weather by a well maintained paint coat
C7	C7	Building Timbers – Moderate Decay Hazard
C8	Plant No. Only	Building Timbers – Low decay Hazard
C9	C9	Sawn timbers for use in Beehive Construction
C10	C10 or TGL	Plywood – Low Hazard
C11	C11	Plywood - Moderate decay hazard
C12	C12	Particle Board – Moderate Decay Hazard

* To be placed after plant number

MAXIMUM SPAN (Metres) FOR TIMBER MEMBERS

Complying with NZS 3604

These tables are designed for timber with a maximum depth of up to 300 mm and for single-storey or the top storey of multi-storey buildings.

L = Light Roof (Metal)

H = Heavy Roof (Tile)

	RAFTERS 50mm				
	Spacing mm				
Member Depth	600		900		1200
	L	H	L	H	L
100	2.4	2.0	2.1	1.7	1.9
125	3.0	2.5	2.6	2.2	2.4
150	3.5	2.9	3.1	2.6	2.8
200	4.7	3.8	4.1	3.4	3.8
250	5.8	4.7	5.1	4.2	4.7
300	6.8	5.5	6.1	4.9	5.6

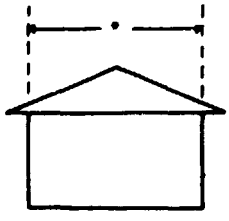
FLOOR JOISTS 50mm			LINTEL 100mm i.e. 2 of 50 mm			
Spacing mm			Span of Supported Roof*			
400	450	600	up to 8 metre		up to 12 metre	
Live Load 1.5 kPa			L	H	L	H
1.8	1.7	1.6	1.5	1.2	1.2	1.0
2.3	2.2	2.0	2.0	1.5	1.5	1.3
2.8	2.7	2.4	2.4	1.8	1.8	1.6
3.8	3.6	3.2	3.1	2.4	2.4	2.1
4.8	4.6	4.1	3.9	3.0	3.0	2.6
5.7	5.5	5.0	4.8	3.6	3.6	3.2

NOTE: Refer to NZS 3604 for fixing and stabilising requirements.

N.B. Span means the clear distance between supports measured along the member.

T.R.A.D.A.

PREPARED FOR THE TIMBER INDUSTRY by N.Z. TIMBER RESEARCH & DEVELOPMENT ASSN. P.O. BOX 3048 WELLINGTON.



What is the Timber Preservation Council Inc.?

The Council is a body formed by the timber treatment industry. Its aim is to establish and maintain high standards of timber treatment.

THE BOARD

Chairman – Murdoch McLean, BSc. Retired managing director of Hickson Timber Protection (NZ) Ltd. Background: Chemistry.

Members –Dr Sandy McQuire, BSc (Edinburgh), BSc (Auckland), Ph.D (Leeds). Retired director of Wood Technology Division, Forest Research Institute. A scientist and consultant of world renown in timber and timber preservation.

Mark de Bazin, BE (Mech) with first class honours (Auckland). Manager (Corporate Development) Milling, Pinex Timber Products.

John Pearce, BE (Mech), Auckland. Operations manager, Tasman Lumber Company.

Brent Lonn, BSc (Massey). Has studied at the Royal College of Forestry (Sweden) and Business School (Berkely), University of California. General manager of Prolog Industries Ltd.

Secretary – Wayne Coffey, NZ Timber Industry Federation executive director

Executive officer – Brian Poole, NZ Timber Industry Federation.

The Council welcomes a free and open exchange of information and views with consumers. In the first instance enquiries should be directed to Brian Poole, PO Box 308, Wellington. Ph: (04) 735-200.

How to specify treated timber

SPECIFICATION	BRAND	END USE
LOW DECAY HAZARD	H1	FRAMING, FLOORING, PLYWOOD, INTERIOR FINISHING, PAINTED WEATHERBOARDS.
TERMITE HAZARD	H2	NOT APPLICABLE IN N.Z., BUT MAY BE USED FOR EXPORT TIMBER.
MODERATE DECAY HAZARD	H3	FENCE RAILS, BATTENS, PALINGS, DECKING, EXTERIOR JOINERY, PLYWOOD, STAINED WEATHERBOARDS.
HIGH DECAY HAZARD	H4	FENCE POSTS, AGRICULTURAL POSTS, CRIBWALLS, PLYWOOD, SAWN TIMBER.
SEVERE DECAY HAZARD	H5	HOUSE PILES AND POLES, HORTICULTURAL POSTS AND POLES, TRANSMISSION POLES, PLYWOOD, SAWN TIMBER.
MARINE HAZARD	H6	MARINE PILES AND TIMBER.

REMEMBER TO SPECIFY WOODMARK BRANDED PRODUCTS – YOUR ASSURANCE OF TIMBER TREATMENT QUALITY

THE WOODMARK

Your assurance of timber treatment quality

Government has decided that from 1 April 1988 the Timber Preservation Authority will phase out in favour of an industry administered quality assurance scheme for treated timber. The new body will be the Timber Preservation Council. The Council's brand will be the Woodmark.

From 1 April 1988 your assurance of timber treatment quality will be the Woodmark

95% of treated timber production is now licenced under the Woodmark scheme.

By April we expect 100% coverage.

Published by the
TIMBER PRESERVATION COUNCIL,
PO BOX 308, WELLINGTON.

What is the Woodmark?

Timber bearing the Woodmark will have been treated to the Council's specifications. These are at least as high as those set by the old Timber Preservation Authority.

The specifications will be listed in a Standards Association of New Zealand Miscellaneous Publication MP101. These standards are adopted by local authorities annually as a basis for their construction by-laws.

Who can use the Woodmark?

Only companies with treatment plants holding a Woodmark licence can use the Woodmark. The list of treaters holding the Woodmark licence will be widely published.

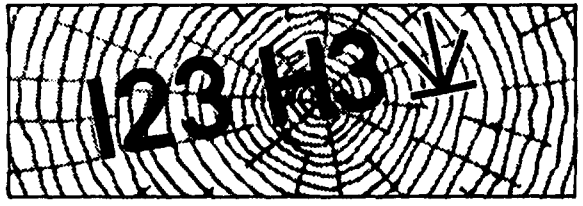
Where will the Woodmark appear?

The Woodmark will be burn branded for end marking and roller branded for continuous marking. Eventually a system of plastic coded end tags will be introduced.

The Woodmark will only be applied to wood treated after 1 April, 1988. For that reason it may take several months before the Woodmark appears on all timber in the market.

Will plant numbers and hazard classes be branded?

Plant numbers and hazard class markings will continue in exactly the same form as at present and under the same definition.



How will the Council enforce its Standards?

1. Sampling

The Council's inspectors will visit each plant at least four times a year (same frequency as TPA), checking material in each hazard class by chemical spot test (where appropriate). Materials not adequately treated will be sent to the Council's analyst (a TELARC registered laboratory) for examination.

Failure will result in the immediate suspension of the plant's Woodmark licence for treating in the hazard class in question. The plant would need to be successfully resampled, (at that plant's expense), and after assistance from its technical advisers, before use of the Woodmark could continue.

2. Quality Assurance Plans

A requirement for a Woodmark licence will be the installation and operation of a standard quality assurance plan. This plan, drawn up by the Council and administered by independent technical advisers prescribes correct methods of operation, details the documentation to be kept and the in-plant sampling and checking to be done. The Council will retain independent auditors who will regularly check compliance with the quality assurance plan.

Again, failure to comply can lead to the suspension or termination of a Woodmark licence.

3. Other pressures

The incorporation of MP101 in by-laws, the recognition of the Woodmark by consumers and inspectors, and the reluctance of chemical suppliers to sell to unlicenced plants will all bring considerable market and institutional pressure to bear in favour of licencing and compliance.

What recourse do consumers have?

Recourse is unchanged from the present situation. Recourse is with your supplier under the Sale of Goods Act.

BRANDING.

All timber treated to Timber Preservation Authority specifications must be branded according to the Branding Regulations. The brand shown on the end of each piece of timber treated (with the exception of small dimensioned material) will show the plant number, distinguishing the registered treatment plant which treated the timber, and the Hazard Specification number denoting the Hazard Situation for which the timber has been treated.
The following table summarizes the Hazard Situations, typical uses and the brands.

HAZARD SITUATION	TYPICAL USES	BRAND Plant no. plus:
Out of ground – protected from weather	House framing, interior finishing, flooring, painted weatherboards.	H1
As for H1, but termite protection	Not applicable in N.Z., but may be used for export timber	H2
Out of ground but exposed to weather	Fence battens, fence palings exterior joinery, deckings, rails, plywood and particle board	H3
In ground, high decay hazard	Fence posts, agricultural posts, crib walls, plywood	H4
In ground severe decay hazard	House piles or poles, horticultural posts and poles, transmission poles plywood foundation panelling	H5
In contact with sea water	Marine piles	H6

1. **SHORT FORM OF SPECIFICATION FOR GENERAL BUILDING CONTRACTS:**
"Timber Treatment:
Timber grades and species required to be treated by the relevant N.Z.S.S. shall be treated to the current specifications of the Timber Preservation Authority."

   For most building work this specification will be completely comprehensive. Reference to the tables will show that every component of a conventional structure is covered. The T.P.A. hazard specifications detail the end uses to which each specification applies, also the acceptable preservatives and processes by which each may be applied and species which may be treated. Items such as preservative, penetration and retention and the registration and approval of Plants are fully covered by the T.P.A. Specifications.

2. **DETAILED FORM OF SPECIFICATION**
In works where a range of environments for timber components will occur, the treatment specification may best be covered by a schedule noting the relevant hazard specification. The schedule could cover other details of the timber specification such as grade, species, finish, use of water repellents. The preamble to the schedule should then include wording as follows:—
"Timber shall be treated to the requirements of the Timber Preservation Authority to the Hazard Specification noted in the Schedule".

APPROVALS OF VARIOUS TREATMENTS, PROCESSES AND PRESERVATIVES:

The Timber Preservation Authority is a body constituted under the Timber Preservation Regulations 1955. Its function is to secure and maintain a high standard of timber preservation and to ensure that the public interest is protected in matters relating to timber preservation. It aproves preservatives and methods of treatment. The Authority publishes its specifications and its officers carry out regular inspections of all treatment plants.

The New Zealand Wood Preservers Association (Inc.), is an Association of firms and individuals engaged in, or concerned with, timber preservation. The activities of the Association complement those of the T.P.A. and also extend into the promotion of treated timber.

Expert advice on wood preservation and associated matters is available from the Association through its Technical Committee and the Technologists of its member companies.

Branding:
All treated timber is required to be identified by branding, with minor exceptions.

End branding consists of the plant number plus an abbreviated form of the Hazard Specification, i.e. H3.

Repetitive Face Branding is required for planer gauged scantlings, framing timbers, weatherboards, and flooring. Other dressed lines may be face branded within 150mm of one end, or carry a legible end brand.

Fence battens and timbers 50mm x 25mm and smaller are not required to be branded.

Full details of the branding requirements of the T.P.A. are included in their Specifications and any variation to these is subject to special T.P.A. dispensation.

TIMBER PRESERVATION GUIDE NOTES

NEW ZEALAND WOOD PRESERVERS' ASSOCIATION

P.O. Box 1208 – Wellington

APRIL 1986

TIMBER PRESERVATION GUIDE NOTES

INTRODUCTION.

Timber Species.

Over the last twenty or thirty years, the use of exotic softwoods, in particular Pinus radiata, has become commonplace. This has been necessitated by the depletion and more recently the conservation of our native forests and has been made possible through the technology of wood preservation, allowing a naturally non durable timber to be used in any decay hazard situation by impregnating it with chemicals.

Public Understanding.

Although public knowledge of wood preservation is increasing, there is still a large degree of lack of understanding concerning the different types of treatment and the fact that timber is treated to different levels to protect it against different hazard situations.

Basis of Protection.

The basis of timber preservation lies in the introduction into the wood of chemicals which are toxic to the wood-destroying agencies such as the wood borers and wood-rotting fungi. Where conditions of use are favourable to fungal attack, higher concentrations of preservative are required to prevent their growth. It is also necessary that the toxic chemical should remain permanently in the wood.

Leaching. If the preservative loading is reduced by the action of water carrying away the chemical (a process which is called leaching), eventually the amount of preservative present in the timber will be inadequate to prevent attack.

Different Preservatives.

The most widely used preservatives are known as CCAs (copper-chrome-arsenic compounds). These are sold under a number of trade names but all do the same job, reacting with the wood so that after impregnation they remain fixed and will resist removal by leaching. Wood can be treated for any hazard situation with these chemicals, differing quantities of the chemicals giving the different degrees of protection.

Boron compounds and non-fixable arsenic compounds however, can only be used in situations where the wood is not exposed to the weather and is not in contact with the ground. This is because although the chemicals afford protection to the wood, being non-fixed they will easily leach out.

Light organic solvent preservatives (LOSP) are controlled formulations of toxic chemicals in a solvent carrier. Timber treated with LOSPs should not be cut or worked after treatment and unless water repellents are included in the formulation the timber should not be used in exposed, unprotected situations unless it is first painted.

HAZARD SPECIFICATIONS.

New Zealand has changed from the old system of Commodity Specifications to Hazard Specifications to come in line with Australian Standards. This means all treated timber will fall into one of the categories from Hazard 1 to Hazard 6 as follows:

Hazard Specification H1.

Low Hazard. Large volumes of sawn timber are for use in building construction and treatment to this level will give protection for timber which is to be used out of ground contact and which is continuously protected from the weather by roofs, walls or paint and which have adequate ventilation.

Hazard Specification H2.

Termite Hazard. This is not applicable in New Zealand as it relates to termite protection.

Hazard Specification H3.

Moderate Decay Hazard. Wood treated with non-fixed preservatives is not suitable for use in this situation which is exposed to the weather although not in contact with the ground. Fence battens and palings, exterior joinery, decking, rails, plywood and particle board to be used externally all fall into this specification and should be treated with CCA or LOSP preservatives.

Hazard Specification H4.

High Decay Hazard. Timber for use in ground contact where conditions are favourable for the development of decay, such as posts and landscaping timbers but where the end use is not critical are treated to this hazard specification. LOSP preservatives are not approved for this level and CCA's are the only water-borne preservatives which can be used.

Hazard Specification H5.

Severe Decay Hazard. Timber for use in ground contact where conditions are optimum for the development of decay and where the end use is critical must be treated to this hazard level. House piles and poles, transmission poles, horticultural poles, wooden foundations are all end uses which fall into this specification.

Hazard Specification H6.

Marine Hazard. Where exposure involves contact with sea water and likely attack by marine organisms, timber must be treated to the still higher retention of preservative, meeting Hazard Specification H6. Timber supplied to lower levels of retention may fail prematurely. In the case of small boats which are regularly lifted from the water or protected by fibreglass or anti-fouling paints, etc., protection against decay by treatment to a moderate hazard Commodity Specification is recommended.

Special Hazard Timber.

Where timber is used in areas where conditions are significantly different from any of the above broad groups, contact should be made with the appropriate purveyor of the preservative salts for technical advice and guidance.

RESAWING. Where possible, resawing after treatment should be avoided. However, where this is not possible wood exposed in cutting should be treated with a T.P.A. approved surface preservative. Otherwise, exposed, under treated heartwood could cause premature failure.

IMPORTANCE OF CORRECT ADVICE.

The correct use of treated timber must be encouraged and finally controlled by the timber merchant. Correct advice given to buyers and to those who specify what qualities are to be used, on construction work, etc., can in time remedy today's lack of knowledge among the purchasers of timber, and will ultimately result in timber orders being correctly specified to suit the job for which the order is required.

ANNEX 3

DRAFT PROGRAMME FOR A TECHNICAL COURSE ON TIMBER CONSTRUCTION

Time	Wednesday	Thursday	Friday	Saturday	Sunday
08:00	Registration Administration /H	Wood properties grading /L	Wood props Moisture relationships /L	Wood props Strengthening Basic stresses /L	Free Church? Bus?
08:50	Opening Minister University UNIDO /Z/M/H	Design Beams Columns /L	Design Trusses /F	Design Portal Frames /F	
08:40	Coffee	Coffee	Coffee	Coffee	
10:00	Timber Industry Forestry Milling Process./Z	Materials Glulan /F	Materials Plywood Partical Board /?	Materials Fire /?	Catch up on Lab Work?
10:50	Wood properties /H	Processing Drying Planning /Z	Processing Mechanical Grading Proof Load /L	Processing Economic Specification /H	
11:40	Elevenses	Elevenses	Elevenses	Elevenses	Elevenses
12:00	Lunch	Lunch	Lunch	Lunch	Lunch
13:30	Lab Intro /M	Lab	Lab	Lab	Cricket?
14:30	Lab Experiment Design /F				
15:30	Coffee	Coffee	Coffee	Coffee	Coffee
15:45	Discussion Question	Lab	Lab	Lab	
16:45	Social			Social	
17:00	Dinner	Dinner	Dinner	Dinner	Dinner
19:30	Film	Film	Film	Film	Film
20:15	Free	Lab report	Lab report	Lab report	
21:30					

Notes Codings /X - Lecturer F - Francis
H - Hallett
L - Leicester
M - Mackechnie
Z - Zimbabwe industry/Government
? - To decide

Monday	Tuesday	Wednesday	Thursday	Friday
Wood Preserva-tion /F	Codes Engineering /L	Travel to Mutare	Site visits (2)	Return to Harare
Design Housing /H	Codes Housing /F			
Coffee	Coffee	Coffee	Coffee	
Materiasl Hardware /L	Design Examples /L,M,F			
Processing Treatment /F	Design Examples /L,M,F			
Elevenses	Elevenses	Elevenses	Elevenses	Elevenses
Lunch	Lunch	Lunch	Lunch	Lunch
Lab	Consolida-tion lab experi-ments Discussion Lab expts	Site visits (2) /Z	Site visits (2) /Z	Group Discussion C l o s e S o c i a l
Coffee	Coffee			
Lab	Lab Facts + codes discussion			
Dinner	Dinner	Dinner	Dinner	Dinner
Film	Film	Group Discussion	Group Discussion	
Lab report	Pack for travel			

Totals:
F 9
H 4
L 9
M 3 plus all labs
Z 8
? 2

DORIES - GENERAL CHARACTERISTICS

RURAL DEVELOPMENT: COASTAL FISHING BOAT MAKING

In developing countries, artisanal fishing in a wide variety of locally built boars is much more important than industrial fishing. Equiping traditional boats with an outboard motor allows for faster trips, but exploitation costs are very high. In Third World countries fishing villages are spread along the the entire coast and uprooting families to regroup the fishermen around rare fishing ports would be unacceptable. In order to safeguard their way of life and traditions, it is thus necessary to base, near their villages, a new type of artisanal yet modern boat, which would be motorized, and which can easily be drawn up on beaches. The dory -a flat-bottomed boat of a design which has been used off Newfoundland, Canada for more than a century- would be ideal for the life conditions in those areas.

Average service life: This boat is constructed of marine plywood which is treated right through with chemical preservatives against all wood destroying elements. It can last over 12 years whereas many traditional boats such as the pirogue have an average lifespan of three years (unless made from increasingly rare naturally durable and often costly exportable species).

Capacity: Due to its length (8 m) and width (2.30 m) the dories can be loaded with 3000 kgs of loose fish or 500-1000 kgs in one or two isotheric boxes.

A shelter for the fishermen is built in fro or at the rear of the boat, depending on local customs. This boat is manned by three or four persons.

Handling and performance qualities: In Newfoundland, where the sea is known to be very rough, accidents to dories are very rare. A well built dory does not capsize nor will it sink even if full of water because of its wooden construction and because the isotheric box, normally built into the structure, forms a natural flotation chamber.

The motor: The dory is equiped with a 12-25 HP diesel, which can last ten years and should consume only 3-4 litres of fuel per hour, whereas the usual outboard motor consumes 10-12 litres of petrol and lasts two years. This, together with the dory's size, means that a range of about 3 hours or 20 miles is possible (and overnights as well) which greatly increases the possible catch and so economy for the fishermen.

The construction costs would be relatively low and the economic return is usually enough for fishermen to own their own boats (either individually or on some cooperative basis).

UNIDO believes that manufacturing facilities can be set-up to make two prototypes to introduce the techniques and to give the fishermen a chance to appreciate the dory's characteristics and potential. To date, these boats have been made and successfully introduced in India (Madras), Brazil (Salvador), Madagascar (Majunga-Amborovy) and in the Wallis and Futura Islands (South Pacific) under French aid and other countries have expressed serious interest.

ANNEX 5

Project for the Countries of East and Southern Africa (PTA)

JOB DESCRIPTION

DP/RAF/87/117/11-51/J.12[illegible]

Post title: Consultant in Timber Construction.

Duration: 2.5 months.

Date required: July 1989

Duty station Lusaka (with travel in the PTA of East and Southern Africa).

Purpose of project: To develop Plantation-based forest industries in the PTA.

Duties: The Consultant will work with counterpart staff, national coordinators and consultants within the framework of the PTA Secretariat and the subregional project, under the general guidance of the Chief Technical Adviser (CTA) based in Lusaka. In particular, he will:

1. Review the annotated literature study prepared by the Universities of Nairobi and Harare under the direction of the CTA and be responsible for its submission to UNIDO HQ.

2. Survey building regulations and structural design codes and procedures in the PTA countries as they influence the use of timber in construction and identify particular areas where timber use is constrained;

3. Analyse (1) and (2) results, and, together with staff of Civil Engineering Department, University of Harare, (or equivalent if changed) develop the detailed programme for a 3 week "Technical Course on Timber Construction" (TCTC) planned for Spring 1990, in Harare. This will include agreeing on details of lectures (annotated headings) and of the inputs from University of Harare staff and local industrialists/officials as well as a subcontract with University of Harare for logistical support;

1. Prepare a report summarizing the activities and results of the mission and appending the Draft Aide-Memoire and Programme for the TCTC.

Qualifications: Wood technologist or timber engineer (Civil Engineer with ample experience in timber structures, preferably with practical experience in the region and a knowledge of global problems facing the use of timber in construction and international actions being taken.

Language: English; knowledge of French an advantage.

Background information: The UNDP project "Intra-regional Cooperation in Plantation-based Forest Industries" (RAF/87/117) began in late 1988 with the objective of promoting "regional economic integration for long-term improvement of regional cooperation for the benefit of the people in the respective countries". The immediate objectives are to identify forest plantation resources, industries and markets which may be developed further through sub-regional cooperation; to promote expanded use of plantation timber and increase national, intra-regional and export trade from plantation-based forest industries; to rationalize these industries, improve their efficiency and use of raw materials and production facilities thereby enabling substitution of imports; and, to develop manpower at all levels.

Characteristic of the sub-region is the poor distribution of forest resources, the land-locked nature of some countries, the pressures of agriculture on scarce forest reserves and the need to create rural employment opportunities.

Some countries still have significant natural forests (Angola, Mozambique and Uganda) but most countries in the PTA must increasingly rely on plantations, but, owing to lack of consultation between countries, considerable duplication of effort has been evident with a concomitant reduction in results.

The project is oriented towards improving utilization and promoting a coordinated approach to wood processing and the use of timber in construction. Basic to these aims are better knowledge of the existing enterprises, their potential, the situation with respect to current use of timber in buildings and structures and an appreciation of the institutional facilities already established that could be strengthened to upgrade the sector.