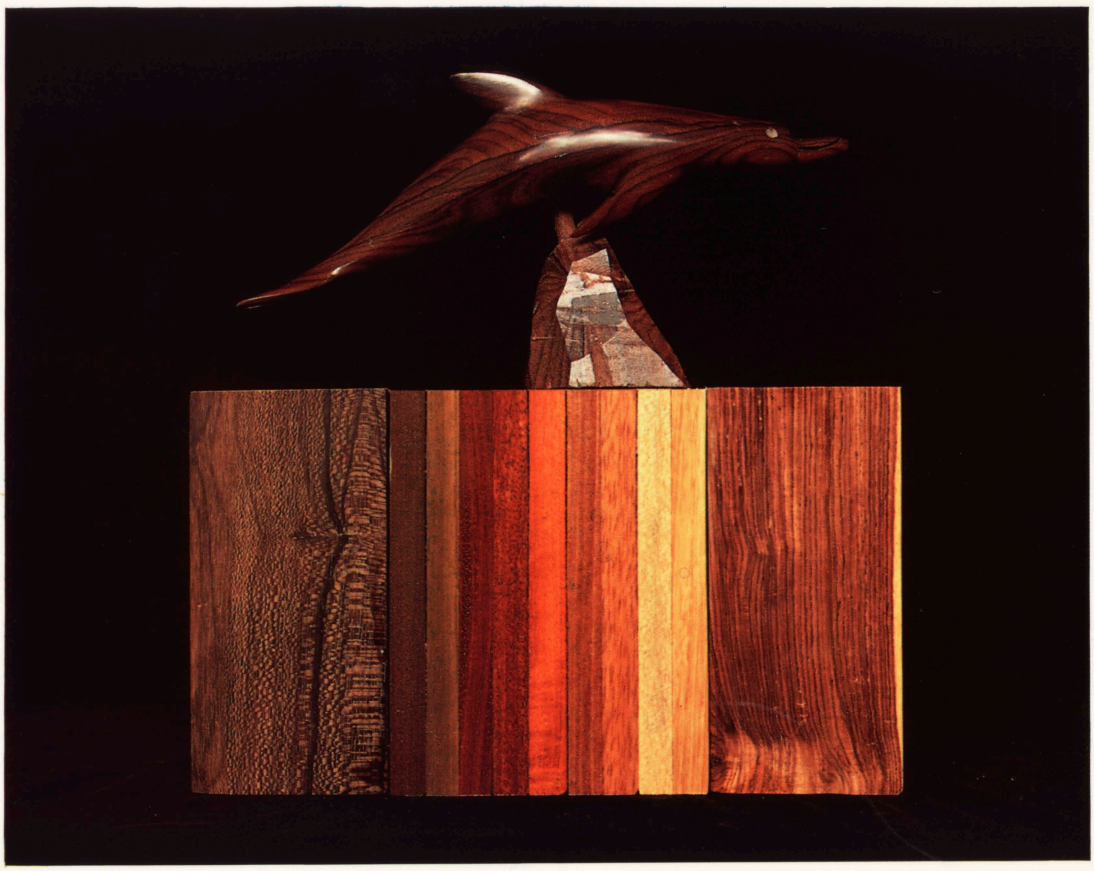
TROPICAL FORESTRY PAPERS 20

A Guide to the Use of Mexican and Belizean Timbers

R. Echenique–Manrique & R.A. Plumptre



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Cover illustration (Photo: Mr. J. Baker)

A collection of timbers from Belize with a carving of a dolphin made from ziricote (*Cordia dodecandra*).

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A Guide to the Use of Mexican and Belizean Timbers

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PREFACE

There is little doubt that fewer tropical timbers are being used at present than could be used. There are many reasons for this, but the major one is the bewildering number of species, all with different properties, which confuses the timber buyer; the result is that buyers tend to keep to the ones they know. This precludes the use of other, perfectly suitable, woods because of ignorance that they can be used. Lack of knowledge of how to treat and use timbers also contributes to their not being used or to their being used unsuitably.

This publication has arisen from the realisation that, although much is known of the properties of tropical timbers by researchers and scientists, this information is not easily available to the ordinary wood user. We have attempted, therefore, to provide a guide, for Mexico and Belize, on which timbers can be used for what purposes and how they should be used.

The guide aims to cater for the normal user who wants simple guidelines on woods suitable for particular jobs, but it also aims to give more detailed information for engineers, architects and furniture makers on properties, treatments and methods of use at a more specialised level.

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They also wish to record thanks to Dr. Consuelo Savin at Instituto Nacional de Investigaciónes Sobre Recursos Bióticos (INIREB) and Dr. Victor Morales of Laboratorio de Ciencia y Tecnologia de la Madera (LACITEMA) and their staffs for a very friendly welcome and for providing similar facilities during the second author's visit to Mexico.

They are particularly grateful to Dr. Goodwin-Bailey and Mrs. Julie Smith the creators of "PROSPECT", the database on wood properties, which provided much of the information used.

Thanks are also due to Dr. John Brazier of the Building Research Establishment in U.K. for inspiration and advice given in the preparation of the work.

Mr. J.R. Palmer provided, from his own collection of Belizean timbers, the samples shown on the cover of this publication. The carved dolphin is made of Cordia dodecandra and was bought by the second author in Belize.

Finally, the long suffering secretaries, Mrs. Cynthia Bunday, Miss Caroline Budden and Miss Teresa Nicholas, deserve a particular form of gratitude for creating what order there now is out of chaos.

CONTENTS

1. Introduction

The problems of utilising the thousands of species of tree, found in tropical forests, in an efficient manner, to make useful products, have perplexed tropical foresters and wood-using industries for a long time. The number of species is large, the number of properties, which together determine whether a species is used for a particular end-use,is often quite large and the quantities available of any one species at a particular time are often quite small.

In general people use timbers known to them to do particular jobs; they will be reluctant to change and use other timbers for the simple reason that 'The devil they know is better than the devil they do not know'. Incentives to take new species are provided either by lack of availability of a preferred timber or by unacceptable increases in the price of that timber. Very often the user of the timber does not have close contacts with the producer; this lack of contact and knowledge of what alternative woods could be available is a further hindrance to the utilisation of more species. Finally, both producers and users often do not know much about the properties of the woods or the correct ways of using them, such as timber drying and preservation.

It is usually easier to get new species accepted on local timber markets than on export markets for many reasons:

there is better contact between producer and user

timbers can be supplied in small quantities for trial and are generally used in smaller quantities

the requirements for quality and grade are lower because the cost of transporting timber overseas ensures that only the top grades are used

the local markets are more varied and versatile

the penalties of using timbers which do not make a perfect product are less and the price of the timber is more significant on local markets so that new species introduced at low prices are attractive.

Commonly used, currently valuable, woods usually have the following characteristics;

they are available in considerable and sustainable quantities

they are attractive in appearance

they are durable and resistant to rot and insect attack

and they are tolerant of misuse, particularly inadequate drying before use.

By contrast the woods which are not used are often non-durable, available in limited quantities, and more difficult to process to get a high quality product.

The more valuable and more easily used woods are, however, becoming scarce in many tropical countries and they are consequently getting expensive.

This is true in Mexico and Belize and there is a need to make use of the many other species in a manner which uses all the information available about them to ensure that they are used for the right purpose, in the right way.

This suggests that some method is required of grouping timbers, which are capable of being used for the same end-use. Attempts have been made in various parts of the world to group species in this way and a very brief history of these attempts is given below in section 1.1.

The prime requirements of any classification system are that it should be as simple and easy to use as possible while at the same time being precise enough to make certain that the properties specified for any particular end-use will ensure that timbers used for that purpose perform satisfactorily. It is not just the properties of the timbers themselves, but also the way in which timbers are prepared for use that is important. It is not, therefore, merely what timber is used but also how it is used that matters.

1.1 Examples of Grouping Methods

One of the earliest groupings of tropical woods was the grouping of various dipterocarp species as 'meranti' in Malaysia. The timbers were of similar density, colour and general appearance although light red, dark red and yellow merantis were distinguished from each other.

The eucalypts have also been grouped in Australia for a long time and the system used there has been described by Keating (1980).

The second author was involved in the 1960s in devising a simple method of grouping timbers for general building construction in Uganda into light, medium and heavy construction woods according to wood density. The system operated satisfactorily and resulted in a timber group being specified for any particular job rather than individual species.

Brazier and Webster have been working in Britain on properties required for different end-uses and these have been published in Webster (1978) and Webster et al. (1984). The former deals with windows, doors, cladding and flooring and the latter with furniture. They are both written for use in the United Kingdom to specify requirements using either home-grown or imported woods.

These are only some amongst a number of classification systems that have been devised and have operated with varying degrees of success.

1.2 The aim of the present classification

The aim of this publication is to provide a simple system of grouping by end-use and specifying what properties are required, what known species are suitable and how the species should be used. It covers only the use of sawnwood and does not deal with its production from the tree.

The guide is built around eighteen tables, each covering one end-use for timber. At the simplest level all timbers listed in a table can be considered suitable for that use. Other timbers may also be suitable but

at present the information available on their properties is inadequate to classify them; as more information becomes available, woods can be added to the tables.

The contents of tables and the appendices, however, give considerable additional information on the degree of suitability of the timbers for the end-use and also on how they should be used.

1.3 To whom is the classification directed?

The guide can be used by small wood buyers who, by consulting the tables, can select timbers suitable for different end-uses. With some attention to treatments specified at the head of each table, the woods can then be used.

They have also been designed so that the more sophisticated buyer of timber can obtain more information on particular species properties, the grades and standards which can be applied to that end-use and on the property ranges considered suitable for the end-use. It is hoped, therefore, that it will be valuable to a wide range of timber users.

At present the guide is species-orientated to the extent that each end-use has a table in which are listed species suitable for that use but, at the same time, the properties required for that use are also given in the postscript to the table; the relative importance of properties is given in the tables, the most important properties being on the left and the least important on the right of the table. The obligatory and then the desirable property requirements are, therefore, defined so that other species can be added as their properties become known. It is, however, convenient and useful to have lists of timbers with known properties which are considered to be suitable for the end-use defined in the table.

2. Development of the Classification

2.1 Main sources of information

The technical information about the species of timber used in this classification has been generated in many research centres throughout the world, and more recently within Mexico by the institutions created for these purposes. The information is spread throughout many publications, however, we were fortunate to have access at the Oxford Forestry Institute, to PROSPECT (Programmed Retrieval of Species by the Property and End-use Classification of their Timbers) which is a computer based information retrieval system, developed recently. The use of this system simplified greatly the search for the technical information needed, since in PROSPECT we were able to find the data generated for a great number of species, especially those produced outside Mexico. Other sources of information were publications not included yet in PROSPECT, mainly those published in Mexico in the last ten years. These additional sources of information are contained in the list of references.

2.2 Selection of end uses

The main criteria that were employed in selecting the end-uses for this classification were either that the volume available of that species

should be large or the timber should be of superior quality, with striking appearance or specific technical properties which could produce high priced articles with large added value.

In this manner eighteen end-uses were selected, representing structural elements for exteriors and interiors, furniture, railway sleepers, tool handles, novelty items etc. We have by no means included all the possible end-uses of the timbers in this classification, but we think that we have included the most important ones.

All the end-uses selected are based only on the utilisation of solid sawn timber.

2.3 Methodology used in developing the classification

The basis for the development of this classification was found in the papers and classifications developed by Brazier (1978, 1979, 1980) and Keating (1978, 1979, 1980). For each of the eighteen end-uses chosen, we defined what we thought would be the most important performance requirements, for products to be manufactured and used under local conditions in Mexico and Belize, to give long term performance. In other words the products do not necessarily meet strict end-use requirements appropriate to other countries with somewhat different market and technology characteristics. Our main concern was to define those end-use requirements which would give, as far as possible, a product of good quality and long service life, allowing for the current technology and market expectations in these countries which are not the same as those required for 'export' markets.

Having defined the end-use requirements, the next step was to translate them into ranges of timber technical characteristics such as natural durability of heartwood, machinability, mechanical properties, quality of timber, etc. Once this was done we searched the information sources available and from them we matched the technical properties given by the end-use requirements with those of the different timber species. It is important to call attention to the fact that the information that was available for each of the species was based sometimes on reports from a great number of tests and trees sampled, and on other occasions it was based on limited testing; for some of the properties we were not able to find any information at all.

This means that the reliability of the information provided in this classification is not the same for all species or all characteristics for a particular species and end-use. We decided that, even though this might cause some problems in the utilisation of some of the less thoroughly tested species, the problems could perhaps be solved by the user by modifying somewhat the production process.

Another alternative was to include only those species that have been extensively tested, and in this manner increase the reliability of the information provided. By doing this, however, the number of timber species that could be included in the classification had to be greatly reduced, and if this were done we would be defeating, to a great degree, one of our main purposes in providing this classification, which is to promote a greater and better utilisation of the lesser-known or secondary species of the tropical and temperate forests of the countries.

The user of this classification, therefore, needs to be aware of this weakness, should proceed with caution in selecting timber species, and should, whenever possible, first conduct trials using small quantities of wood.

Another very important point to make is that this Guide is not concerned with timber processing characteristics from roundwood to dry sawn wood. We are quite aware that for successful utilisation of timber species the sawing characteristics from log to board, and drying characteristics should be well known, and taken into account. In this case, since this classification is directed mainly at the manufacture of wood products, and to try to simplify it as much as we could, we assumed that the timber species would be obtained, already sawn, dried and classified according to one of the standards mentioned at the beginning of each of the eighteen tables.

This assumption, of course, is not totally valid for the conditions of Mexico and Belize where it is still common to purchase green sawn wood from the sawmillers, which then has to be dried mostly by air drying or, even worse, is used in the green condition. Nevertheless there is now a tendency for the sawmiller or distributer to air or kiln-dry the boards and to classify them according to standards before selling and delivering them to the manufacturers. This trend we think will continue and we hope to foster it through the use of this classification.

It is very important for the wood products research centres to continue their work in determining the technological characteristics of more species, particularly sawing and drying properties. It is also vital to provide this information as soon as possible to the sawmillers and timber distributors, in order to complement the information provided here.

The species of timbers for each end-use are listed in the table according to what we consider to be the commercial name most commonly used in Mexico. The number that appears next to it corresponds to the scientific name of the species which can be found in Table 1 in the index together with the commercial names preferred in Belize.

2.4 Nomenclature of properties and terms

To simplify the use of the classification, the properties of the timbers were described by terms such as good, low, durable etc, which we thought would be easier to understand and interpret than units such as '450 kg/cm^2 for stress at the proportional limit in compression perpendicular to the grain.' The terminology used was gathered from a diversity of sources, such as PROSPECT, reference books on wood properties, and was, in some cases, modified to adapt to this classification. The classification of properties that were used is given below (paragraph 3.3).

3. Classification of Timbers

3.1 How to use the classification

The following steps are involved in selecting suitable timbers using the classification.

1. Decide on the end-use for which the timber is to be used.

2. Decide where the timber is to be used in Mexico or Belize.

3. Read the preliminary notes to the table for the end-use chosen (main text tables 1-18).

4. Select from the table timbers of the desired properties which are locally available.

5. Decide on quality or grade of timber needed after consulting the table and necessary grading rules in Appendices 3, 4, 6 or 7.

6. Decide on dimensions of timber required, consulting Appendix 2 if necessary.

7. Decide on the percentage moisture content required for the timber in the location where it is to be used.

8. Decide on the decay and dry wood termite hazards from Appendix 5, Annex 1 and 2 and determine from Tables of Annex 5 whether the timber requires preservative treatment for the end-use for which it is intended. If treatment is required select the best treatment available locally and get the timber treated.

Note: In Tables 1-18 blank spaces have been left where properties are not known. If readers discover information on these 'missing' properties it can be written into the blank spaces.

Example 1

Problem: Timber is required to build the structure of the roof of a private house in Veracruz.

Answer: Using table 1 select three species. laurel blanco, nargusta and negrito are selected as being suitable and available. From Appendix 4 hardwood strengths Grade 1 or 2 should preferably be used but, if unavailable or too costly, ungraded timber can be used if carefully selected by the buyer.

From Appendix 5 Annexes 1 and 2 Veracruz is a high hazard zone for both decay and drywood termites and from Table 1 of Appendix 5 only species classified as durable to decay can be used untreated in a high hazard zone. Therefore preservative treatment is not required for laurel blanco and nargusta but is required for negrito which is best treated to a retention of 8.0 kg/m^3 with CCA (copper chrome arsenate) preservative but could be treated with borax by diffusion, by double vacuum treatment or by dipping in an oil solvent preservative. The last method would not give such a good length of life as the other methods.

The wood should be dried to 16.5% moisture content (Appendix 1) before being built into the roof of the building in Veracruz.

Example 2

Problem: Timber is required for utility furniture to be used in La Paz BC.

Answer: From Table 11 Palo de Sangre is chosen; from Appendix 1 it requires to be dried to 9.5% mc. and it does not require preservative treatment for this use. Dimensions of timber are selected, suitable for the type of furniture being made and no grading is necessary unless it is desired to use the higher hardwood appearance grades from Appendix 7. (Furniture parts can often be cut from lower grades of timber by cutting out defects).

Example 3

Problem: Timber is required for facia and weather boarding of a house in Belize.

Answer: Possible timbers are hogplum (Spondias mombin), barba jolote (Pithecellobium arboreum) or bitterwood (Vatairea lundellii). From table 4 and table 11 Appendix 5 bitterwood is rather dense but can be used untreated, barba jolote can also be used untreated while hogplum must be treated. Treatment of the hogplum should be either pressure treatment with copper chrome arsenate preservative to 8.0 kg/m^3 and >6 mm penetration, by double vacuum treatment or by immersion in an oil solvent preservative (Appendix 5 Table 1). Sapwood of all species must be treated. The timber should be dried to 17% mc (Appendix 1). For a high quality job, grades 1 and 2 of the hardwood appearance grading rules (Appendix 7) should be specified.

An oil based stain finish painted on by brush gives a good decorative finish and some extra protection against rot.

3.2 Tables of end uses with requirements for use, property limits and recommmendations for use

(Tables 1-18) see overleaf.

TABLE 1. STRUCTURAL ELEMENTS FOR ROOFS, WALLS, AND FLOORS: Rafters, purlins, tie beams, posts, studs, sills, joists, and boards.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content = Average EMC % for exteriors, as shown in Appendix 1.
- Recommended standard for dimensions = NOM-C-224-1983, as shown in Appendix 2.
- Recommended standard for pine structural grades = NOM-C-239-1985, as shown in Appendix 3.
- Recommended standard for hardwood structural grade = As shown in Appendix 4.
- All sapwood is considered PERISHABLE, and together with the heartwood of those species that is not DURABLE or VERY DURABLE must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Nailing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Planing and surface characteristics	Observations
1	Fir Abies sp.	Non-durable	Permeable	Easy and good	Low	Low	Low	Low	Easy and good	
3	Coton de Caribe Alchornea latifolia	Non-durable to moderately durable	Permeable	Easy and excellent	Medium	Low	Low	Low	Easy and excellent	
5	Wild mamee Alseis yucatanensis	Moderately durable	Moderately resistant	Easy and good	High	High	High	Medium	Easy and good	
7	Espave Anacardium excelsum	Non-durable	Permeable to moderately resistant	Easy and not recorded	Medium	Low	Low	Low	Difficult and poor finish	
8	Angelin Andira inermis	Durable	Resistant	Easy and good	High	Very high	Medium to high	Medium	Easy and excellent	It produces during machining dust which might cause allergies to some people.
13	Breadnut Brosimum alicastrum	Non-durable	Moderately resistant	Difficult and fair	High	Very high	Very high	Very high	Easy and excellent	
15	Red gombolimbo Bursera simaruba	Perishable	Permeable	Easy and excellent	Medium	Low	Low	Low	Easy and very poor	
22	Salmwood Cordia alliodora	Durable	Moderately resistant	Easy and good	Medium	Medium	Low	Low to medium	Easy and good	Some tendency to split on nailing. Sapwood susceptible to Lyctus attack.
29	Morototo Didymopanax morotoni	Non-durable	Permeable to moderately resistant	Easy and good	Medium	Medium to high	Medium to high	Low to Medium	Easy and fair	
32	Tubroos Enterolobium cyclocarpum	Non - to moderately durable		Easy and good	Medium	Low	Low to medium	Low	Easy and poor	Dust from machining is pungent and irritating to mucous membranes and may cause allergies.

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Nailing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Planing and surface characteristics	Observations
36	Zopo Guatteria anomala	Non-durable		Easy and good	Medium	Low	Medium	Medium	Easy and very poor	
38	Possumwood Hura crepitans	Non-durable to moderate durable	Permeable	Easy and good	Medium	Low	Low to medium	Low	Easy and poor	It produces during machining dust which might cause allergies to some people.
40	Copaia Jacaranda copaia	Perishable	Permeable	Easy and good	Medium	Low	Low to medium	Low to medium	Easy and poor	
43	Liquidambar Liquidambar styraciflua	Non to moderately durable	Permeable	Easy and good	Medium	Medium to high	Low to high	Low to medium	Easy and good	
45	Palo gusana Lonchocarpus hondurensis	Durable	Resistant	Easy and fair	High	High	High	High	Easy and fair	
47	Tepehuaje Lysiloma acapulcensis	Durable	Extremely resistant	Easy and good	Medium	Medium	Medium	Medium	Easy and fair	
48	Tzalam Lysiloma bahamensis	Durable		Easy and good	High	Medium to high	Medium to high	Medium	Easy to fair	
56	Pajulté Mosquitoxylon jamaicense	Durable	Extremely resistant	Easy and fair	High	Medium	Medium	Medium	Easy and fair	
58	Hormiga Ormosia toledoana	Non-durable	Moderately resistant	Easy and good	High	High	Medium	Medium	Easy and fair	
59	Provision tree Pachira aquatica	Non-durable	Permeable	Easy and excellent	Medium	Low	Low	Low	Easy and very poor	
61	Aguacate Persea americana	Non-durable	Moderately resistant	Easy and not recorded	Medium	Medium to high	Medium	Low to medium	Easy and good	
62	Pine Pinus spp.	Perishable to non-durable	Permeable	Easy and good	Medium	Medium	Medium	Medium	Easy and good	
70	Barba jolote Pithecellobium arboreum	Non-durable to durable	Permeable	Easy and fair	High	Medium	High	High	Easy and fair	
71	Guacibán Pithecellobium leucocalyx	Durable		Easy and fair	Medium	Low	Medium	Medium	Easy and fair	
79	Palo de sangre Pterocarpus hayesii	Non-durable	Permeable	Easy and excellent	Medium	Low	Low	Medium	Easy and poor	
80	Molinillo Quararibea funebris	Non-durable	Permeable	Easy and fair	Medium	Medium	Low	Low	Easy and fair	
91	Negrito Simarouba glauca	Non-durable	Permeable	Easy and good	Medium	Low	Low	Low	Easy and good	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Nailing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Planing and surface characteristics	Observations
92	Hogplum Spondias mombin	Perishable to non-durable	Moderately resistant to permeable	Easy and excellent	Medium	Low	Low	Low	Easy and good	
97	Waika chewstick Symphonia globulifera	Moderately to durable	Extremely resistant	Easy to fair	Medium	High to very high	High to very high	High to very high	Easy and poor	
99	Jolmashté Talauma mexicana	Non-durable		Easy and good	Medium	High	Medium	Medium	Easy and poor	
101	Southern wild mahogany Tapirira guianensis	Non-durable	Moderately reistant	Easy and good	Medium	Medium to high	Low to medium	Low to medium	Easy and good	
102	Nargusta Terminalia amazonia	Durable to very durable	Extremely resistant	Easy and excellent	High	High	High	High	Easy and excellent	
103	Bitterwood Vatairea lundelli	Durable	Moderately resistant	Easy and fair	High	High	High	High	Easy and very poor	
104	Banak Virola koschnyi	Non-durable	Permeable	Easy and good	Medium	Medium to high	Low to medium	Low to medium	Easy and good	
105	Yemeri Vochysia hondurensis	Non-durable to moderately durable	Permeable	Easy and excellent	Medium	Low	Low to medium	Medium	Easy and poor	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to take stresses with a convenient weight/strength ratio so that the pieces can be handled easily by one or two men.
- Can be worked easily with hand or power tools.
- Able to take and hold common fastners.
- Must offer guarantee of long term performance from the point of view of strength, and resistance to deterioration by wood destroying organisms especially in high risk situations such as pieces in very high humidity environments, or pieces in contact with the ground.

With these requirements the timbers should be within the property limits shown below:

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = 0.38 - 0.65 g/cm^3.
- MOE range = 71000-150000 kg/cm^2, or 6960-14700 N/mm^2, Air-dry.
- MOR range = 400-1350 kg/cm^2, or 39-132 N/mm^2, Air-dry.
- Crushing strength = 300-700 kg/cm^2, or 29-69 N/mm^2, Air-dry.
- Resistance to splitting by nails = Good to excellent.
- Easy to nail.
- Easy to plane with poor to excellent surfaces.
- Natural durability of heartwood = Durable to very durable.

OR

- Preservative treatment = Sapwood and heartwood moderately resistant to permeable.

TABLE 2. STRUCTURAL ELEMENTS FOR CONCRETE SHUTTERING OF BUILDINGS: Posts, beams, tie beams and boards.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content = 8-16%.
- Recommended standard for dimensions = NOM-C-224-1983, Appendix 2.
- Recommended standard for softwoods structural grades = NOM-C-239-1985, Appendix 3.
- Recommended standard for hardwood structural grade = Appendix 4.
- Even though, the timber for this end use requires only short time strength, we recommend the use of structural grades, because we believe that concrete shuttering should be designed by engineers, so as to have a safe, and low cost structure, where the elements could be used on repeated occasions.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Nailing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of ruputure	Maximum crushing strength	Planing and surface characteristics	Observations
1	Fir Abies sp.	Easy and good	Low	Low	Low	Low	Easy and good	
3	Coton de caribe Alchornea latifolia	Easy and excellent	Medium	Low	Low	Low	Easy and excellent	
5	Wild mamee Alseis yucatanensis	Easy and good	High	High	High	Medium	Easy and good	
7	Espave Anacardium excelsum	Easy and not recorded	Medium	Low	Low	Low	Difficult and poor	
12	Cedro espino Bombacopsis quinatum	Easy and good	Medium	Medium	Low	Low to medium	Easy and good	
15	Red gombolimbo Bursera simaruba	Easy and excellent	Medium	Low	Low	Low	Easy and very poor	
19	Bastard mahogany Carapa guianensis	Easy and fair	High	Medium	Medium	Medium	Easy and good	
22	Salm wood Cordia alliodora	Easy and good	Medium	Medium	Low	Low to medium	Easy and good	Sapwood susceptible to Lyctus attack.
24	Orejuelo Cymbopetalum penduliflorum	Easy and good	Medium	Low	Low	Low	Easy and good	
27	Sac-chacah Dendropanax arboreus	Easy and good	Medium	Low	Low	Low	Easy and fair	
29	Morototo Didymopanax morototoni	Easy and good	Medium	Medium to high	Medium to high	Low to medium	Easy and fair	
32	Tubroos Enterolobium cyclocarpum	Easy and good	Medium	Low	Low to medium	Low	Easy and poor	
36	Zopo Guatteria anomala	Easy and good	Medium	Low	Medium	Medium	Easy and very poor	

Timber Number	Species Common name Scientific name	Nailing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of ruputure	Maximum crushing strength	Planing and surface characteristics	Observations
38	Possum wood *Hura crepitans*	Easy and good	Medium	Low	Low to medium	Low	Easy and poor	Chipped and torn grain are encountered with extreme interlocked grain.
40	Copaia *Jacaranda copaia*	Easy and good	Medium	Low	Low to Medium	Low to medium	Easy and poor	
43	Liquidambar *Liquidambar styraciflua*	Easy and good	Medium	Medium to high	Low to high	Low to medium	Easy and good	
47	Tepehuaje *Lysiloma acapulcensis*	Easy and good	Medium	Medium	Medium	Medium	Easy and fair	
56	Pajulté *Mosquitoxylon jamaicense*	Easy and fair	High	Medium	Medium	Medium	Easy and fair	
58	Hormiga *Ormosia toledoana*	Easy and good	High	High	Medium	Medium	Easy and fair	
59	Provision tree *Pachira aquatica*	Easy and excellent	Medium	Low	Low	Low	Easy and very poor	
61	Aguacate *Persea americana*	Easy and not recorded	Medium	Medium to high	Medium	Low to medium	Easy and good	
62	Pine *Pinus* spp.	Easy and good	Medium	Medium	Medium	Medium	Easy and good	
71	Guacibán *Pithecellobium leucocalyx*	Easy and fair	Medium	Low	Medium	Medium	Easy and fair	
75	Masamorro *Poulsenia armata*	Easy and very poor	Medium	Low	Medium	Medium	Easy and very poor	
79	Palo de sangre *Pterocarpus hayesii*	Easy and excellent	Medium	Low	Low	Medium	Easy and poor	
80	Molinillo *Quararibea funebris*	Easy and fair	Medium	Medium	Low	Low	Easy and fair	
91	Negrito *Simarouba glauca*	Easy and good	Medium	Low	Low	Low	Easy and good	
92	Hogplum *Spondias mombin*	Easy and excellent	Medium	Low	Low	Low	Easy and good	
93	Bellota *Sterculia apetala*	Easy and good	Low	Very low	Low	Very low	Easy and good	
97	Waika chewstick *Symphonia globulifera*	Easy and fair	Medium	High to very high	High to very high	High to very high	Easy and poor	

Timber Number	Species Common name Scientific name	Nailing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of ruputure	Maximum crushing strength	Planing and surface characteristics	Observations
99	Jolmashté Talauma mexicana	Easy and good	Medium	High	Medium	Medium	Easy and poor	
101	Southern wild mahogany Tapirira guianensis	Easy and good	Medium	Medium to high	Low to medium	Low to medium	Easy and good	
104	Banak Virola koschnyi	Easy and good	Medium	Medium to high	Low to medium	Low to medium	Easy and good	
105	Yemeri Vochysia hondurensis	Easy and excellent	Medium	Low	Low to medium	Medium	Easy and poor	
108	Prickly yellow Zanthoxylum belizense	Easy and good	Medium	Medium	Medium	Medium	Easy and good	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to take and hold common fastners, mainly nails.
- Able to take stresses with a convenient weight/strength ratio so that the pieces can be handled easily by one or two men.
- Can be worked easily with hand and power tools, especially hand tools used on construction sites.

With these requirements the timbers should be within the property limits shown below:

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = 0.38 - 0.56 g/cm^3.
- MOE range = 71 000-120 000 kg/cm^2, or 6960-11750 N/mm^2, Air-dry.
- MOR range = 400-1100 kg/cm^2, or 39-108 N/mm^2, Air-dry.
- Crushing strength = 300-550 kg/cm^2, or 29-54 N/mm^2, Air-dry.
- Easy to nail.
- Resistance to splitting by nails = Good to excellent.
- Easy to saw, especially with hand tools.
- Locally, many species are used in the round as uprights. Essentially the only prerequisites are that timber should be more or less straight, and inexpensive.

TABLE 3. NON-STRUCTURAL ELEMENTS FOR EXTERIORS: Door-frames, -stiles, -rails, - muntins, -lippings, -panels,-window-frames, -sills, -casements, and -sashes.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content = Average EMC% for exteriors as shown in Appendix 1.
- Recommended standard for softwood appearance grades = NOM-C-18-1986 1st and 2nd grades Appendix 6.
- Recommended standard for hardwood appearance grades = Appendix 7, grades 1-3.
- All sapwood is considered PERISHABLE, and together with the heartwood that is not DURABLE or VERY DURABLE must be preservative treated following recommendations in Appendix 5.
- Pith included in the individual pieces is not allowed.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Dimensional movement	Grain	Machinability and surface characteristics	Screwing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Texture	Observations
1	Fir Abies sp.	Non-durable	Permeable	Medium to small	Straight	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Low	Low	Low	Low	Medium	
3	Coton de Caribe Alchornea latifolia	Non-durable to moderately durable	Permeable	Medium to large	Straight wavy to inter-locked	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and poor Mortising = Easy and poor Sanding =Easy and very poor	Easy and excellent	Medium	Low	Low	Low	Medium to coarse	
6	Luin Ampelocera hottlei	Durable	Permeable	Medium	Straight to inter-locked	Sawing = Easy Planing = Easy and poor Moulding = Easy and excellent Mortising = Easy Sanding = Easy	Easy and very poor	High	Medium	Medium	High	Medium	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Dimensional movement	Grain	Machinability and surface characteristics	Screwing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Texture	Observations
7	Espave Anacardium excelsum	Non-durable	Permeable to moderately resistant	Small	Inter-locked	Sawing = Easy and good Planing = Moderate and poor Moulding = Easy and good Mortising = Easy and good Sanding = Moderate and poor	Easy	Medium	Low	Low	Low	Medium to coarse	
8	Angelin Andira inermis	Durable	Resistant	Small	Straight to inter-locked	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and fair Mortising = Easy and good Sanding = Easy and excellent	Easy and good	High	Very high	Medium to high	High	Coarse	During machining toxic dust is produed which might cause allergies to people.
12	Cedro espino Bombacopsis quinatum	Perishable to durable	Resistant	Medium	Straight to inter-locked	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium	Low	Low to medium	Medium	
13	Breadnut Brosimum alicastrum	Non-durable	Moderately resistant	Small to medium	Straight to inter-locked	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and excellent	High	Very high	Very high	High	Fine	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Dimensional movement	Grain	Machinability and surface characteristics	Screwing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Texture	Observations
21	Cedar Cedrela odorata	Durable	Resistant to extremely resistant	Small	Straight to roe	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Low	Low	Low	Fine to medium	
22	Salmwood Cordia alliodora	Durable	Moderately resistant	Medium	Straight to inter-locked	Sawing = Easy and good Planing = Easy and good Moulding = Easy and poor Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium	Low	Very low to low	Fine to medium	Sapwood susceptible to Lyctus attack.
29	Morototo Didymopanax morototoni	Non-durable	Permeable to moderately resistant	Large	Straight	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and good Mortising = moderate and good Sanding = Easy and good	Easy and good	Medium	Medium to high	Medium to high	Very low to low	Fine to medium	
35	Cramantee Guarea glabra	Moderately durable to durable	Extremely resistant	Medium	Straight to inter-locked	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and fair Sanding = Easy and good	Easy and good	Medium	Low to medium	Low to medium	Low to medium	Medium	
45	Palo gusana Lonchocarpus hondurensis	Durable	Resistant	Medium	Straight to irregu-lar to inter-locked	Sawing = Easy Planing = Easy and good Moulding = Easy and excellent Mortising = Easy Sanding = Easy	Easy and excellent	High	High	High	High	Medium to coarse	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Dimensional movement	Grain	Machinability and surface characteristics	Screwing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Texture	Observations
46	Yayo Luehea seemannii	Non-durable		Small	Straight to inter-locked	Sawing = Easy and good Planing Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good		Medium	High	Medium	Medium	Medium	
47	Tepehuaje Lysiloma acapulcensis	Durable	Extremely resistant	Medium to small	Straight to inter-locked	Sawing = Moderate and fair Planing = Easy and fair Moulding = Moderate Mortising = Easy Sanding = Easy and fair	Easy and good	Medium	Medium	Medium	Medium	Medium to coarse	
48	Tzalam Lysiloma bahemensis	Durable		Medium	Straight to irregu-lar	Sawing = Easy Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy	Easy and good	High	Medium	Medium	Medium	Medium	
56	Pajulté Mosquitoxylon jamaicense	Durable	Extremely resistant	Medium	Inter-locked	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy and fair	Easy and fair	High	Medium	Medium	Medium	Medium	
62	Pine Pinus spp.	Non-durable	Permeable	Medium to small	Straight	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium	Medium	Low to medium	Medium to fine	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Dimensional movement	Grain	Machinability and surface characteristics	Screwing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Texture	Observations
70	Barba jolote Pithecellobium arboreum	Durable to very durable		Medium	Inter-locked	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and fair Mortising = Easy and fair Sanding = Easy and fair	Easy and fair	High	Medium	High	Medium	Medium to coarse	
71	Guaciban Pithecellobium leucocalyx	Durable to very durable		Medium	Inter-locked	Sawing = Easy Planing = Easy and poor Moulding = Easy and fair Mortising = Easy Sanding = Easy	Easy and excellent	Medium	Low	Medium	Medium	Coarse	
77	Mesquite Prosopis juliflora	Durable to very durable		Medium to small	Straight to irregu-lar	Sawing = Moderate and good Planing = Moderate and fair Moulding = Moderate Mortising = Moderate Sanding = Easy and good	Moderate and good	High	High	High	High	Coarse	
80	Molinillo Quararibea funebris	Non-durable	Permeable	Medium	Slightly inter-locked	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy and fair	Easy and fair	Medium	Medium	Low	Low	Fine to medium	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Dimensional movement	Grain	Machinability and surface characteristics	Screwing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Texture	Observations
87	Primavera Roseodendron donnell-smithii	Non-durable to moderately durable		Small	Straight to inter-locked	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Low	Low	Low	Medium	
91	Negrito Simarouba glauca	Non-durable	Permeable	Medium	Straight	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Low	Low	Low	Medium	
92	Hogplum Spondias mombin	Perishable to non-durable	Permeable to moderately resistant	Small	Straight to inter-locked	Sawing = Easy and good Planing = Easy and good Moulding = Easy and very poor Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Medium	Low	Low	Low	Medium to coarse	
93	Bellota Sterculia apetala	Non-durable	Permeable	Medium to small	Straight	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good		Low	Very low	Low	Low	Medium	
96	Mahogany Swietenia macrophylla	Durable	Extremely resistant	Small	Straight to inter-locked	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and fair Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Medium	Low to medium	Low	Low	Fine to medium	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Dimensional movement	Grain	Machinability and surface characteristics	Screwing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Texture	Observations
97	Waika chewstick Symphonia globulifora	Moderately durable to durable	Extremely resistant	Medium	Straight to irregular	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and fair Mortising = Easy and fair Sanding = Easy and good	Easy and fair	Medium	High to very high	High to very high	Medium	Coarse	
98	Apamate Tabebuia rosea	Moderately durable to durable	Permeable	Small	Straight to interlocked	Sawing = Easy and good Planing = Easy and good Moulding = Easy and excellent Mortising = Easy and excellent Sanding = Easy and excellent	Easy and good	Medium	Medium	Low to medium	Low	Medium	
101	Southern wild mahogany Tapirira guianensis	Non-durable	Moderately resistant	Medium	Straight	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium to high	Low to medium	Low	Fine	
102	Nargusta Terminalia amazonia	Durable to very durable	Extremely resistant	Medium to small	Interlocked straight irregular	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and fair	High	High	High	High	Medium	
103	Bitterwood Vaitairea lundelli	Durable	Resistant	Medium	Wavy to interlocked	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and very poor Mortising = Easy and fair Sanding = Easy and fair	Easy and good	High	High	High	High	Medium to coarse	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Dimensional movement	Grain	Machinability and surface characteristics	Screwing and splitting characteristics	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Texture	Observations
104	Banak Virola koschnyi	Non-durable	Permeable	Large	Straight	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium to high	Low to medium	Low	Medium to coarse	
106	Yemeri Vochysia hondurensis	Non-durable to moderately durable	Permeable	Medium	Inter-locked	Sawing = Easy and fair Planing = Easy and poor Moulding = Easy and poor Mortising = Easy and fair Sanding = Easy and fair	Easy and excellent	Medium	Low	Low to to medium	Low	Medium	Tendency to blunt cutting edges.

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to take and hold well common metal fasteners (mainly screws, with a low tendency to splitting).
- Machined joints in combination with adhesives, must not be to difficult to prepare.
- With low to medium tendency to distortion, to checking and to dimensional changes due to variations in moisture content. Must hold its shape without undue distortion.
- Must offer guarantee of long term performance from the point of view of resistance to deterioration by wood destroying organisms, and weathering.
- Able to obtain good surfaces after machining.
- Low tendency to resin exudation.
- Able to resist scratches, indentations (preferable).

With these requirements the timbers should be within the property limits shown below:

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = 0.38-0.65 g/cm^3.
- Grain = Straight, when interlocked generally straight.
- MOE range = 71000-150000 kg/cm^2, or 6960-14700 N/mm^2, Air-dry.
- MOR range = 400-1350 kg/cm^2, or 39-132 N/mm^2, Air-dry.
- Lateral hardness range = 200-800 kg, or 1970-7850 N, Air-dry.
- Resistance to splitting by screws = Fair to excellent.
- Easy to glue.
- Texture = Medium/coarse, to fine.
- Dimensional movement = Medium to small.
- General machinability = Easy and good, that is, easy to saw and plane with good to excellent surfaces, as well as sanding, mortising, recessing and routing.
- Natural durability of heartwood = Durable to very durable.

OR

- Preservative treatment = Sapwood and heartwood moderately resistant to permeable.
- Paintability = Should take and hold paints and finishes well.
- Low resin content and soluble extractives that could stain or modify the colour of finishes.

TABLE 4. NON STRUCTURAL ELEMENTS FOR EXTERIORS OF BUILDINGS: Facia boards and weather boarding.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content = EMC% for exteriors as shown in Appendix 1.
- Recommended standard for pine appearance grades = NOM-C-18-1986, Appendix 6, grades 1 and 2.
- Recommended standard for hardwood appearance grades = Appendix 7, grades 1-3
- All sapwood is considered PERISHABLE, and together with the heartwood that is not DURABLE or VERY DURABLE must be preservative treated following the recommendations in Appendix 5.
- Pith included in the individual pieces is not allowed.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Nailing and splitting characteristics	Dimensional movement	Basic density	Machinability and surface characteristics	Grain	Texture	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
1	Fir Abies sp.	Non-durable	Permeable	Easy and good	Medium to small	Low	Sawing = Easy and good Planing = Easy and good	Straight	Medium	Low	Low	Low	
3	Coton de Caribe Alchornea latifolia	Non-durable to moderately durable	Permeable	Easy and excellent	Medium to to high	Medium	Sawing = Easy and good Planing = Easy and excellent	Straight wavy to inter-locked	Medium to coarse	Low	Low	Low	
7	Espave Anacardium excelsum	Non-durable	Permeable to moderately resistant	Easy	Large	Medium	Sawing = Easy and good Planing = Moderate and poor	Inter-locked	Medium to coarse	Low	Low	Low	
45	Palo gusano Lonchocarpus hondurensis	Durable	Resistant	Easy and good	Medium	High	Sawing = Easy Planing = Easy and good	Straight irregular to inter-locked	Medium to coarse	High	High	High	
47	Tepehuaje Lysiloma acapulcensis	Durable	Extremely resistant	Easy and good	Medium to small	Medium	Sawing = Moderate and fair Planing = Easy and fair	Straight to inter-locked	Medium to coarse	Medium	Medium	Medium	
56	Pajulté Mosquitoxylum jamaicensis	Durable	Extremely resistant	Easy and fair	Medium	High	Sawing = Easy and fair Planing = Easy and fair	Inter-locked	Medium	Medium	Medium	Medium	
62	Pine Pinus spp.	Non-durable	Permeable	Easy and good	Medium to small	Medium	Sawing = Easy and good Planing = Easy and good	Straight	Medium	Medium	Medium	Low to medium	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Nailing and splitting characteristics	Dimensional movement	Basic density	Machinability and surface characteristics	Grain	Texture	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
70	Barba jolote Pithecellobium arboreum	Durable to very durable		Easy and fair	Medium	High	Sawing = Easy and fair Planing = Easy and fair	Inter-locked	Medium to coarse	Medium	High	Medium	
71	Guaciban Pithecellobium leucocalyx	Durable to very durable		Easy and fair	Medium	Medium	Sawing = Easy Planing = Easy and poor	Inter-locked	Coarse	Low	Medium	Medium	
91	Negrito Simarouba glauca	Non-durable	Permeable	Easy and good	Medium	Medium	Sawing = Easy and good Planing = Easy and good	Straight	Medium	Low	Low	Low	
92	Hogplum Spondias mombin	Perishable to non-durable	Permeable to moderately resistant	Easy and excellent	Small	Medium	Sawing = Easy and good Planing = Easy and good	Straight to inter-locked	Medium to coarse	Low	Low	Low	
93	Bellota Sterculia apetala	Non-durable	Permeable	Easy	Medium to small	Low	Sawing = Easy and good Planing = Easy and good	Straight	Medium to coarse	Very low	Low	Low	
101	Southern wild mahogany Tapirira guianensis	Non-durable	Moderately resistant	Easy and good	Medium	Medium	Sawing = Easy and good Planing = Easy and good	Straight	Fine to medium	Medium to high	Low to medium	Low	
103	Bitterwood Vatairea lundelli	Durable	Resistant	Easy and fair	Medium	High	Sawing = Easy and fair Planing = Easy and fair	Wavy to inter-locked	Medium to coarse	High	High	High	
104	Banak Virola koschnyi	Non-durable	Permeable	Easy and good	Large	Medium	Sawing = Easy and good Planing = Easy and good	Straight	Medium to coarse	Medium to high	Low to medium	Low	
106	Yemeri Vochysia hondurensis	Non-durable to moderately durable	Permeable	Easy and excellent	Medium	Medium	Sawing = Easy and fair Planing = Easy and poor	Inter-locked	Medium	Low	Low to medium	Low	Tendency to blunt cutting edges.

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Easy to nail with low tendency to splitting.
- With low to medium tendency to distortion, to checking, and to dimensional changes due to variations in moisture content. Holds its shape without undue distortion.
- Must offer guarantee of long term performance from the point of view of resistance to deterioration by wood destroying organisms, and weathering.
- Able to obtain good surfaces after machining.

- Able to take and hold finishes such as paints and stains.
- Low tendency to resin exudation and staining by extractives.
- Available in relatively long lengths.

With these requirements the timbers should be within the property limits shown below:

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = 0.38-0.65 g/cm^3.
- Grain = Straight, when interlocked generally straight.
- MOE range = 71000-150000 kg/cm^2, or 6960-14700 N/mm^2, Air-dry.
- MOR range = 400-1350 kg/cm^2, or 39-132 N/mm^2, Air-dry.
- Lateral hardness range dry = 200-800 kg, or 1970-7850 N, Air-dry.
- Resistance to splitting by nails = Good to excellent.
- Texture = Coarse, to medium/fine.
- Dimensional movement = Medium to small.
- General machinability = Easy and good, that is, easy to saw and plane with good to excellent surfaces.
- Natural durability of heartwood = Durable to very durable.

OR

- Preservative treatment = Sapwood and heartwood moderately resistant to permeable.
- Paintability = Should take and hold paints and stains well.
- Low resin content and soluble extractives that could stain or modify the colour of the finishes.

TABLE 5. NON-STRUCTURAL ELEMENTS FOR INTERIORS OF BUILDINGS: Door -frames, -stiles, -rails, -muntins, -lippings, panels, skirting boards, stair rails and treads.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content = Average EMC% for interiors as shown in Appendix 1.
- Recommended standard for pine appearance grades = NOM-C-18-1986 grades 1st and 2nd Appendix 6.
- Recommended standard for hardwood appearance grades = grades 1st and 2nd Appendix 7.
- All sapwood is considered very susceptible to dry-wood termites, and Lyctus and together with heartwood that is not RESISTANT OR MODERATELY RESISTANT must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
1	Fir Abies sp.	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Permeable	Medium to small	Medium	Straight	Low	Low	Low	Low	
3	Coton de Caribe Alchornea latifolia	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and poor Mortising = Easy and poor Sanding = Easy and very poor	Easy and excellent	Susceptible	Permeable	Medium to large	Medium to coarse	Straight wavy to inter-locked	Medium	Low	Low	Low	
6	Luin Ampelocera hottleii	Sawing = Easy Planing = Easy and poor Moulding = Easy and excellent Mortising = Easy Sanding = Easy	Easy and very poor	Resistant to to moderately resistant	Permeable	Medium	Medium	Straight to inter-locked	High	Medium	Medium	High	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
7	Espave Anacardium excelsum	Sawing = Easy and good Planing = Moderate and poor Moulding = Easy and good Mortising = Easy and good Sanding = Moderate and poor	Easy	Resistant	Permeable to moderately resistant	Small	Medium to coarse	Inter-locked	Medium	Low	Low	Low	
8	Angelin Andira inermis	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and fair Mortising = Easy and good Sanding = Easy and excellent	Easy and fair	Moderately resistant	Resistant	Small	Coarse	Straight to inter-locked	High	Medium	Low	High	Sapwood susceptible to Lyctus attack. Toxic dust.
9	Mylady Aspidosperma megalocarpon	Sawing = Easy and good Planing = Easy and very good Moulding = Easy and very good Mortising = Easy and good Sanding = Easy and good	Moderate and good		Moderately resistant	Medium	Medium	Straight to irregular	High	High	High	High	
11	Popiste Blepharidium mexicanum	Sawing = Easy and fair Planing = Easy and excellent Moulding = Easy and excellent	Easy and excellent		Resistant	Large	Fine	Straight	High	Low	Medium	Low	
12	Cedro espino Bombacopsis quinatum	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Resistant	Medium	Medium	Straight to inter-locked	Medium	Medium	Low	Low to medium	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
13	Breadnut Brosimum alicastrum	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Moderately resistant to susceptible	Moderately resistant	Small to medium	Fine	Straight to inter-locked	High	Very high	Very high	High	
21	Cedar Cedrela odorata	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and good	Resistant	Resistant to extremely resistant	Small	Fine to medium	Straight to roe	Medium	Low	Low	Low	Sapwood susceptible to insect attack.
22	Salmwood Cordia alliodora	Sawing = Easy and good Planing = Easy and good Moulding = Easy and poor Mortising = Easy and good Sanding = Easy and good	Easy and good	Resistant	Moderately resistant	Medium	Fine to medium	Straight to inter-locked	Medium	Medium	Low	Very low to low	Sapwood susceptible to Lyctus attack.
29	Morototo Didymopanax morototoni	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and good Mortising = Moderate Sanding = Easy and good	Easy and good	Susceptible	Permeable to moderately resistant	Large	Fine to medium	Straight	Medium	Medium to high	Medium to high	Very low to low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
32	Tubroos Enterolobium cyclocarpum	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and fair Mortising = Easy and fair Sanding = Easy and fair	Easy and good	Resistant		Small	Coarse	Inter-locked and straight	Medium	Low	Low	Low	Dust from machining is pungent and irritating to mucous membranes and may cause allergies. Sapwood susceptible to insect attack.
35	Cramantee Guarea glabra	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and fair Sanding = Easy and good	Easy and good	Moderately resistant	Extremely resistant	Medium	Medium	Straight to inter-locked	Medium	Low to medium	Low to medium	Low to medium	
36	Zopo Guatteria anomala	Sawing = Easy and fair Planing = Easy and excellent Moulding = Easy and very poor	Easy and excellent		Permeable	Small to medium	Coarse	Straight	Medium	Low	Medium	Low	
45	Palo gusano Lonchocarpus hondurensis	Sawing = Easy Planing = Easy and good Moulding = Easy and excellent Mortising = Easy Sanding = Easy	Easy and excellent	Resistant	Resistant	Medium	Medium to coarse	Straight to irregular to inter-locked	High	High	High	High	
46	Yayo Luehea seemannii	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good		Susceptible		Small	Medium	Straight to inter-locked	Medium	High	Medium	Medium	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
47	Tepehuaje Lysiloma acapulcensis	Sawing = Moderate and fair Planing = Easy and fair Moulding = Moderate Mortising = Easy Sanding = Easy and fair	Easy and good	Resistant	Extremely resistant	Medium to small	Medium to coarse	Straight to inter-locked	Medium	Medium	Medium	Medium	
48	Tzalam Lysiloma bahamensis	Sawing = Easy Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy and good	Easy and good			Medium	Medium	Straight to irregular	High	Medium	Medium	Medium	
55	Pimientillo Misanteca peckii	Sawing = Easy and fair Planing = Easy and good Moulding = Easy and excellent	Easy and fair			Small	Medium	Straight	High	High	High	Medium	
56	Pajulté Mosquitoxylum jamaicense	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy and fair	Easy and fair		Extremely resistant	Medium	Medium	Inter-locked	High	Medium	Medium	Medium	
59	Provision tree Pachira aquatica	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and very poor	Easy and excellent	Susceptible	Permeable	Large	Medium	Straight	Medium	Very low	Low	Very low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
62	Pine Pinus sp.	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Permeable	Medium to small	Medium to fine	Straight	Medium	Medium	Medium	Low to medium	
70	Barba jolote Pithecellobium arboreum	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and fair Mortising = Easy and fair Sanding = Easy and fair	Easy and fair		Permeable	Medium	Medium to coarse	Inter-locked	High	Medium	High	Medium	
71	Guaciban Pithecellobium leucocalyx	Sawing = Easy Planing = Easy and poor Moulding = Easy and fair Mortising = Easy Sanding = Easy	Easy and excellent			Medium	Coarse	Inter-locked	Medium	Low	Medium	Medium	
77	Mesquite Prosopis julifolia	Sawing = Moderate and good Planing = Moderate and fair Moulding = Moderate Mortising = Moderate Sanding = Easy and good	Moderate and good	Resistant		Medium to small	Coarse	Straight to irregular	High	High	High	High	Sapwood susceptible to Lyctus attack.
78	Amapola Pseudobombax ellipticum	Sawing = Easy and fair Planing = Easy and excellent Moulding = Easy and fair	Easy and excellent		Moderately resistant	Medium	Fine to medium	Straight to irregular	Medium	Very low	Low	Very low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
79	Palo de sangre Pterocarpus hayesii	Sawing = Easy and good Planing = Easy and good Moulding = Easy and poor Mortising = Easy and good Sanding = Easy and good	Easy and excellent		Permeable	Medium	Medium to coarse	Straight to irregular	Medium	Low	Low	Very low	
87	Primavera Roseodendron donnell smithii	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Susceptible		Small	Medium	Straight to inter-locked	Medium	Low	Low	Low	
89	Chechin blanco Sebastiana longicuspis	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent	Easy and fair			Medium	Medium	Straight	High	High	High	Medium	
90	Chacahuanté Sickingia salvadorensis	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and very poor		Permeable	Large	Fine	Straight to irregular	High	Medium	High	High	
91	Negrito Simarouba glauca	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Permeable	Medium	Medium	Straight	Medium	Low	Low	Low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
92	Hog plum Spondias mombin	Sawing = Easy and good Planing = Easy and good Moulding = Easy and very poor Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Susceptible	Permeable to moderately resistant	Small	Medium to coarse	Straight to inter-locked	Medium	Low	Low	Low	
96	Mahogany Swietenia macrophylla	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and fair Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Moderately resistant	Extremely resistant	Small	Fine to medium	Straight to inter-locked	Medium	Low to medium	Low	Low	
97	Waika chewstick Symphonia globuliflera	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and fair Mortising = Easy and fair Sanding = Easy and good	Easy and fair	Moderately resistant	Extremely resistant	Medium	Coarse	Straight to irregular	Medium	High to very high	High to very high	Medium	
98	Apamate Tabebuia rosea	Sawing = Easy and good Planing = Easy and good Moulding = Easy and excellent Mortising = Easy and excellent Sanding = Easy and excellent	Easy and good	Susceptible	Permeable	Small	Medium	Straight to inter-locked	Medium	Medium	Low to medium	Low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
99	Jolmashté Talauma mexicana	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and poor Mortising = Easy and good Sanding = Easy and good	Easy and excellent			Medium	Medium to coarse	Straight	Medium	High	High	Low	
101	Southern wild mahogany Tapirira guianensis	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Moderately resistant	Medium	Fine	Straight	Medium	Medium to high	Low to medium	Low	
102	Nargusta Terminalia amazonia	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and fair	Resistant	Extremely resistant	Medium to small	Medium	Inter-locked straight irregular	High	High	High	High	
103	Bitterwood Vatairea lundelli	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and very good Mortising = Easy and fair Sanding = Easy and fair	Easy and good	Resistant	Resistant	Medium	Medium to coarse	Wavy to inter-locked	High	High	High	High	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Lateral hardness	Observations
104	Banak Virola koschnyi	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Permeable	Large	Medium to coarse	Straight	Medium	Medium to high	Low to medium	Low	
105	Fiddlewood Vitex gaumeri	Sawing = Easy and excellent Planing = Easy and good Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and fair	Susceptible	Permeable to resistant	Medium	Fine	Inter-locked to irregular	Medium	High	High	High	
106	Yemeri Vochysia hondurensis	Sawing = Easy and fair Planing = Easy and poor Moulding = Easy and poor Mortising = Easy and fair Sanding = Easy and fair	Easy and excellent	Susceptible	Permeable	Medium	Medium	Inter-locked	Medium	Low	Low to medium	Low	
108	Prickly yellow Zanthoxylum beliziense	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Permeable	Small	Coarse	Narrowly inter-locked	Medium	Medium	Medium	Medium	
109	Trementino valador Zuelania guidonia	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and very poor		Resistant	Medium	Fine	Straight	High	High	High	High	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to take and hold well common metal fastners (mainly screws), with a low tendency to splitting.
- Machined joints (in combination with adhesives) must not be difficult to prepare.
- With low to medium tendency to distortion, to checking and dimensional changes due to variation in moisture content. Holds its shape without undue distortion.
- Able to obtain good surfaces after machining.
- Low tendency to resin exudation.
- Able to resist scratches, identations (preferable).
- Must offer guarantee of long term performance from the point of view of strength and resistance to deterioration by insects.
- Low tendency to resin exudation and staining by extractives.

With these requirements the timbers should be within the property limits shown below:-

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = 0.38-0.65 g/cm^3.
- Grain = Straight, when interlocked generally straight.
- MOE range = 71000-150000 kg/cm^2, or 6960-14700 N/mm^2, Air-dry.
- MOR range = 400-1350 kg/cm^2, or 39-132 N/mm^2, Air-dry.
- Lateral hardness = 200-800 kg, or 1970-7840 N, Air-dry.
- Resistance to splitting by screws = Fair to excellent.
- Easy to glue.
- Texture = Medium/coarse to fine.
- Dimensional movement = Medium to small.
- General machinability = Easy and good. That is, easy to saw and plane, with good to excellent surfaces, as well as for sanding, mortising, recessing and routing.
- Paintability = Should take and hold paints and finishes well.
- Heartwood resistant to dry-wood termites and Lyctus if not sapwood and heartwood from resistant to permeable to be preservative treated (depending on risk of attack).

TABLE 6. NON-STRUCTURAL ELEMENTS FOR INTERIORS OF BUILDINGS: Mouldings.

The recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content = Average EMC% for interiors as shown in Appendix 1.
- Recommended standard for softwood appearance grade = NOM-C-18-1986 grade select (Appendix 6).
- Recommended standard for hardwood appearance grades = Grades 1 & 2, Appendix 7.
- All sapwood is considered very susceptible to dry-wood termites, and Lyctus and together with heartwood that is not RESISTANT or MODERATELY RESISTANT must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Grain	Texture	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Basic density	Lateral hardness	Observations
7	Espave Anacardium excelsum	Planing = Easy and poor Moulding = Easy and good Sanding = Difficult and poor	Inter-locked	Medium to coarse	Easy	Resistant	Permeable to moderately resistant	Large	Medium	Low	
21	Cedar Cedrela odorata	Planing = Easy and excellent Moulding = Easy and excellent Sanding = Easy and good	Straight to roe	Fine to medium	Easy and good	Resistant	Resistant to extremely resistant	Small	Medium	Low	
22	Salmwood Cordia alliodora	Planing = Easy and good Moulding = Easy and poor Sanding = Easy and good	Straight to inter-locked	Fine to medium	Easy and good	Resistant	Moderately resitant	Medium	Medium	Very low to low	Sapwood susceptible to Lyctus attack.
29	Morototo Didymopanax morototoni	Planing = Easy and fair Moulding = Easy and good Sanding = Easy and good	Straight	Fine to medium	Easy and good	Susceptible	Permeable to moderately resistant	Large	Medium	Very low to low	
35	Cramantee Guarea glabra	Planing = Easy and excellent Moulding = Easy and excellent Sanding = Easy and good	Straight to inter-locked	Medium	Easy and very poor	Resistant	Extremely resistant	Medium	Medium	Low to medium	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Grain	Texture	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Basic density	Lateral hardness	Observations
40	Copaia Jacaranda copaia	Planing = Easy and poor Moulding = Easy and fair Sanding = Easy and fair	Straight to inter-locked	Medium	Easy and good	Susceptible	Permeable	Medium to large	Medium	Low	
47	Tepehuaje Lysiloma acapulcensis	Planing = Easy and fair Moulding = Moderate Sanding = Easy and fair	Straight to inter-locked	Medium to coarse	Easy and good	Resistant	Extremely resistant	Small	Medium	Medium	
62	Pine Pinus spp.	Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Straight	Medium	Easy and good	Susceptible	Permeable	Medium	Medium	Low	
63	Ayacahuite Pinus ayacahuite	Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Straight	Medium to fine	Easy and good	Susceptible	Permeable	Small	Medium	Low	
64	Pine Pinus lambertiana	Planing = Easy and excellent Moulding = Easy and excellent Sanding = Easy and good	Straight	Medium	Easy and good	Susceptible	Permeable	Small to medium	Low	Low	
66	Ponderosa pine Pinus ponderosa	Planing = Easy and excellent Moulding = Easy and excellent Sanding = Easy and excellent	Straight	Medium	Easy and good	Susceptible	Permeable	Small to medium	Medium	Low	
67	Pine Pinus pseudostrobus	Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Straight	Medium to fine	Easy and good	Susceptible	Permeable	Small	Medium	Low	
80	Molinillo Quararibea funebris	Planing = Easy and fair Moulding = Easy Sanding = Easy and fair	Straight to inter-locked	Fine	Easy and fair		Permeable	Small	Medium	Low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Grain	Texture	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Basic density	Lateral hardness	Observations
87	Primavera Roseodendron donnell-smithii	Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Straight to inter-locked	Medium	Easy and good	Susceptible		Small	Medium	Low	
89	Chechén blanco Sebastiana longicuspis	Planing = Easy and excellent Moulding = Easy and excellent Sanding = Easy and good	Straight	Medium	Easy and very poor			Medium	Medium	Medium	
91	Negrito Simarouba glauca	Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Straight	Medium	Easy and good	Susceptible	Permeable	Medium	Medium	Low	
93	Bellota Sterculia apetula	Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Straight	Medium	Easy	Susceptible	Permeable	Medium to small	Low	Low	
96	Mahogany Swietenia macrophylla	Planing = Easy and excellent Moulding = Easy and fair Sanding = Easy and good	Straight to inter-locked	Fine to medium	Easy and good	Moderately resistant	Extremely resistant	Small	Medium	Low	
98	Apamate Tabebuia rosea	Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Straight to inter-locked	Medium	Easy and good	Susceptible	Permeable	Small	Medium	Low	
101	Southern wild mahogany Tapirira guianensis	Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Straight	Fine	Easy and good	Susceptible	Moderately resistant	Medium	Medium	Low	
104	Banak Virola koschnyi	Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Straight	Medium to coarse	Easy and good	Susceptible	Permeable	Small	Medium	Low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Grain	Texture	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Basic density	Lateral hardness	Observations
105	Fiddlewood Vitex gaumeri	Planing = Easy and good Moulding = Easy and excellent Sanding = Easy and good	Inter-locked to irreg-lar	Fine	Easy and good	Susceptible	Resistant	Medium	Medium	High	The sapwood is permeable to preservatives.

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to take and hold well common metal fastners (mainly nails with a low tendency to splitting).
- With a low tendency to distortion due to variations in moisture content.
- Easy to very easy to machine, especially with moulders, and able to obtain smooth and uniform surfaces.
- Low to no resin exudation or extractives that tend to modify the finishes applied.
- Must offer guarantee of long term performance from the point of view of deterioration by insects.
- Low tendency to resin exudation and staining by extractives.

With all these requirements the timbers should be within the property limits shown below:-

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = 0.38-0.56 g/cm^3.
- Grain = Straight.
- Lateral hardness = 200-600 kg, or 1970-5880 N, Air-dry.
- Machinability = Easy and with good to excellent surfaces, in planing, moulding, and sanding.
- Texture = Medium to fine.
- Dimensional movement = Medium to small.
- Nailing characteristics = Easy and with a low tendency to splitting.
- Paintability = Should take and hold paints and finishes well.
- Heartwood resistant to dry-wood termites and Lyctus, if not, sapwood and heartwood from resistant to permeable to preservative treatment (depending on the risk of attack).

TABLE 7. NON-STRUCTURAL ELEMENTS FOR INTERIORS OF BUILDINGS: Flooring, pedestrian medium to heavy traffic, more than 50 persons/day.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content = Average EMC% for interiors as shown in Appendix 1.
- Recommended standard for hardwood appearance grades = Appendix 7, grades 1-2.
- All sapwood is considered very susceptible to dry-wood termites and Lyctus, and together with heartwood that is not RESISTANT or MODERATELY RESISTANT must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Lateral hardness	Grain	Texture	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Dimensional movement	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
6	Luin Ampelocera hottlei	High	Straight to inter-locked	Medium	Pale yellow with dark lines on edges of growth rings	Indistinct	Sawing = Easy Planing = Easy and good Sanding = Easy and good	Medium	Moderately resistant	Permeable	High	High	
9	Mylady Aspidosperma megalocarpon	High	Straight to inter-locked	Medium to fine	Light pinkish brown or pale yellowish brown	Indistinct	Sawing = Easy Planing = Easy and excellent Sanding = Easy and good	Medium		Moderately resistant	Very high	High	
10	Palo mulato Astronium graveolens	High	Inter-locked and straight to roey	Medium	Brown red or dark reddish brown with black stripes	Striking figure due to irregular longitudinal dark bands	Sawing = Difficult and good Planing = Moderate and good Sanding = Easy and good	Small	Resistant	Extremely resistant to moderately resistant	Very high	High	
13	Breadnut Brosimum alicastrum	High	Straight to inter-locked	Fine	Yellowly white, around knots reddish	Indistinct	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good	Small to medium	Susceptible	Moderately resistant to susceptible	High	High	
14	Bullet tree Bucida buceras	Very high	Straight inter-locked and roey	Medium	Yellowish to greenish brown olive hued	Longitudinal stripes when roey grain	Sawing = Difficult and fair Planing = Difficult and poor Sanding = Easy and good	Large	Resistant	Resistant	Extremely high	Very high	

Timber Number	Species Common name Scientific name	Lateral hardness	Grain	Texture	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Dimensional movement	Resistance to dry-wood termites and/or *Lyctus*	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
18	Degame *Calycophyllum candidissimum*	Medium to high	Straight to irregular	Fine	Light brown to oatmeal colour	Indistinct	Sawing = Difficult and fair Planing = Moderate and fair Sanding = Easy and good	Medium	Moderately resistant		Very high	Medium to high	
28	Ironwood *Dialium guianense*	Very high	Straight to interlocked	Fine to medium	Uniform brown or reddish brown	Indistinct	Sawing = Very difficult and good Planing = Difficult and good Sawing = Moderate and good	Medium	Resistant	Resistant	Extremely high	Very high	High silica content. The cutting edges get dulled.
30	Bustic *Dipholis salicifolia*	Very high	Straight	Fine to medium	Dark reddish brown	Flat sawn soft parabolic figure	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Medium			Very high	Very high	
31	Guaité *Dipholis stevensonii*	Very high	Straight	Medium	Pale reddish brown	Indistinct	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good	Medium			Very high	Very high	
33	Genipa *Genipa americana*	Medium	Straight to interlocked	Fine	Light yellowish brown pinkish or blue overcast	Narrow bands to darker colour wood striped figure	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good	Medium	Susceptible	Permeable	High	Medium	
37	Urucurana *Hieronyma alchorneoides*	High	Irregular interlocked to roey	Coarse	Light reddish brown to dark red to chocolate brown	Flat sawn parabolic markings to variation in colour	Sawing = Difficult and good Planing = Difficult and poor Sanding = Easy and excellent	Medium to large	Moderately resistant	Moderately resistant	High	High	The poor planing characteristics are mainly due to the roey grain.

Timber Number	Species Common name Scientific name	Lateral hardness	Grain	Texture	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Dimensional movement	Resistance to dry-wood termites and/or *Lyctus*	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
39	Courbaril *Hymenaea courbaril*	High	Interlocked and straight to irregular	Fine to medium	Russet to reddish brown with dark streaks	Pronounced due growth rings and dark streaks	Sawing = Difficult and good Planing = Difficult and fair Sanding = Difficult and good	Medium	Resistant	Resistant	Very high	High	Sapwood is permeable to preservatives.
44	Black cabbage bark *Lonchocarpus castilloi*	High to very high	Interlocked	Fine to medium	Dark reddish brown	Flat sawn distinct figure due to parabolic markings	Sawing = Moderate and good Planing = Difficult and good Sanding = Easy and good	Medium	Resistant	Extremely resistant	Very high	High to very high	
49	Fustic *Maclura tinctoria*	Very high	Interlocked to straight	Medium to fine	Golden yellow changing to russet with reddish tinge	Indistinct	Sawing = Moderate and good Planing = Moderate and good Sanding = Moderate and good	Small	Resistant	Extremely resistant	Very high	Very high	
51	Sapodilla *Manilkara zapota*	Very high	Straight	Fine	Dark reddish brown	Indistinct	Sawing = Difficult and good Planing = Moderate and good Sanding = Moderate and good	Small	Resistant	Extremely resistant	Extremely high	Very high	
53	Chechem *Metopium brownei*	Very high	Straight to interlocked	Fine	Bands of dark reddish brown, black green, to pale brown golden hue	Pronounced figure flat and quarter sawn	Sawing = Moderate and good Planing = Easy and good Sanding = Easy and excellent		Resistant	Extremely resistant	Very high	Very high	
54	Chicharra *Mirandaceltis monoica*	High	Interlocked	Fine to medium	Reddish brown	Pronounced due to bands of parenchyma	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Small	Resistant	Extremely resistant	High	Medium to high	

Timber Number	Species Common name Scientific name	Lateral hardness	Grain	Texture	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Dimensional movement	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
60	Amaranth Peltogyne pubescens	Very high	Straight wavy to to inter-locked	Fine	Deep purple turning to dark brown	Indistinct	Sawing = Moderate and good Planing = Moderate and good Sanding = Easy and good	Medium to large	Resistant	Resistant to extremely resistant	Very high	Very high	
69	Jabín Piscidia communis	High	Straight to irregu-lar	Medium	Pale reddish brown	Pronounced figure due to parabolic bands	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Medium			Very high	High	
76	Kanisté Pouteria campechiana	High	Straight to irregu-lar	Fine	Pale greenish brown	Indistinct	Sawing = Easy and good Planing = Easy and fair Sanding = Easy and good	Large			Very high	High	
77	Mesquite Prosopis juliflora	High	Straight to irregu-lar	Coarse	Brownish red	Indistinct	Sawing = Moderate and good Planing = Moderate and fair Sanding = Easy and good	Medium to small	Resistant		Very high	High	
81	Oak Quercus acatenangensis	High	Straight	Coarse	Pale greenish or yellowish brown	Pronounced due to rays and vessel lines	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Small			High	High	
82	Oak Quercus anglohondurensis	Very high	Straight	Coarse	Pale yellowish brown or very pale brown	Pronounced due to rays	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Large			High	High	
83	Oak Quercus crassifolia	High	Straight	Coarse	Dark grey or reddish brown	Pronounced due to rays and vessel lines	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Small			High	High	

Timber Number	Species Common name Scientific name	Lateral hardness	Grain	Texture	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Dimensional movement	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
86	Oak Quercus skinneri	Very high	Straight	Coarse	Dark reddish brown greyish rays	Pronounced due to rays, vessel lines and growth rings	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good	Large			Very high	Very high	
94	Corazón azul Swartzia cubensis	Very high	Straight to irregular	Fine	Dark reddish brown with purple tinge	Flat sawn distinct parabolic figure	Sawing = Moderate and good Planing = Moderate and excellent Sanding = Moderate and good	Medium	Resistant		Very high	Very high	Dust irritating to some people.
95	Billy webb Sweetia panamensis	Very high	Wavy to roey	Fine	Dark yellowish brown with dark streaks	Quarter sawn distinct narrow ribbon	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Medium	Resistant		Very high	Extremely high	
100	Guaya Talisia olivaeformis	High	Interlocked to wavy	Medium to coarse	Pale yellow with greyish brown hues	Indistinct	Sawing = Difficult Planing = Difficult Sanding = Difficult	Medium			Very high	High	
102	Nargusta Terminalia amazonia	High	Interlocked straight irregular	Medium	Yellowish olive to golden brown, reddish brown stripes	Fiddleback figure, or stripe or red roe figure quarter sawn	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good	Medium to small	Resistant	Extremely resistant	High	High	
107	Chintoc Wimmeria bartletti	High	Straight	Very fine	Brown to light reddish brown	Flat sawn parabolic figure due to parenchyma lines	Sawing = Difficult and good Planing = Difficult and good Sanding = Difficult and good	Large			Very high	High	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Should be highly resistant to abrasion and to indentation.
- A smooth and even surface should be obtained after laid and sanded.
- Should be able to take and hold well varnishes and other glossy transparent finishes.
- Preferably should have an attractive colour or grain pattern or figure, especially in the dark coloured woods.
- Preferably the wood should move as little as possible relative to its density, with changes in moisture content.
- Must offer guarantee of long term performance from the point of view of resistance of deterioration by insects.

With these requirements the timbers should be within the property limits shown below:-

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = Greater than 0.65 g/cm^3.
- Lateral hardness range = Greater than 800 kg, or 2850 N, Air-dry.
- Grain = Straight or interlocked. In parquet type of floors it does not matter.
- Texture = Medium/coarse to fine.
- Dimensional movement = Medium to small.
- Machinability = Easy to sand with good to excellent surfaces, as well as planing.
- Paintability = Should be able to take and hold well, varnishes and transparent coatings.
- Heartwood resistant to drywood termites and Lyctus, if not sapwood and heartwood from resistant to permeable to preservative treatment (depending on the risk of attack).

TABLE 8. NON-STRUCTURAL ELEMENTS FOR INTERIORS OF BUILDINGS: Flooring, pedestrian light traffic including residential, less than 50 persons per day; - stair treads and rails.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content = Average EMC % for interiors as shown in Appendix 1.
- Recommended standard for hardwood appearance = Appendix 7, grades 7 and 2.
- All sapwood is considered very susceptible to dry-wood termites and Lyctus, and together with heartwood that is not RESISTANT or MODERATELY RESISTANT must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timbeer and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Lateral hardness	Grain	Texture	Dimensional movement	Machinability and surface characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
2	Alamo plateado Acer skutchii	Reddish brown	Flatsawn pronounced due to growth rings and rays	Medium	Straight	Medium	Medium	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good		Resistant	Medium	Medium	
5	Wild mamee Alseis yucatanensis	Yellow	Indistinct	High	Straight	Very fine	Medium	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good		Moderately resistant	High	High	
6	Luin Ampelocera hottlei	Pale yellow with dark lines on edges of "growth" rings	Indistinct	High	Straight and inter-locked	Medium	Medium	Sawing = Easy Planing = Easy and poor Sanding = Easy	Moderately resistant to highly resistant	Permeable	High	High	
8	Angelin Andira inermis	Yellowish brown to reddish brown	Bands of light coloured parenchyma give distinctive figure	High	Straight to inter-locked	Coarse	Small	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and excellent	Moderately resistant	Resistant	High	High	Toxic dust, sapwood susceptible to Lyctus attack.
9	Mylady Aspidosperma megalocarpon	Light pinkish brown or Pale yellowish brown	Indistinct	High	Straight to inter-locked	Medium to fine	Medium	Sawing = Easy and good Planing = Difficult and good Sanding = Easy and good		Moderately resistant	Very high	High	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Lateral hardness	Grain	Texture	Dimensional movement	Machinability and surface characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
10	Palo mulato Astronium graveolens	Brown red or dark reddish brown with black stripes	Striking figure due to irregular dark longitudinal bands	High	Inter-locked	Medium	Small	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Resistant	Resistant to moderately resistant	Very high	High	
11	Popiste Blepharidium mexicanum	Reddish yellow with pale brown hues	Indistinct	Low	Straight	Fine	Large	Sawing = Easy and fair Planing = Easy and excellent Sanding = Easy and good		Resistant	High	Low	
13	Breadnut Brosimum alicastrum	Yellowish white, around knots reddish	Indistinct	High	Straight to inter-locked	Fine	Small to medium	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good	Susceptible to moderately resistant	Moderately resistant	High	High	
14	Bullet tree Bucida buceras	Yellowish to greenish brown olive hued	Longitudinal stripes when roey grain	Very high	Straight to inter-locked and roey	Medium	Large	Sawing = Difficult and fair Planing = Difficult and poor Sanding = Easy and good	Resistant	Resistant	Extremely high	Very high	
17	Santa María Calophyllum brasiliense	Pink or yellowish pink to brick red to reddish brown	Indistinct	Low to medium	Inter-locked to straight	Medium	Medium	Sawing = Moderate and fair Planing = Moderate and fair Sanding = Easy and good	Moderately resistant	Extremely resistant	Medium	Low to medium	
18	Degame Calycophyllum candidissimum	Light brown to oatmeal colour	Indistinct	Medium to high	Straight to irregular	Fine	Medium	Sawing = Difficult and fair Planing = Moderate and fair Sanding = Easy and good	Moderately resistant		Very high	Medium to high	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Lateral hardness	Grain	Texture	Dimensional movement	Machinability and surface characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
28	Ironwood Dialium guianense	Uniform brown or reddish brown	Indistinct	Very high	Straight to inter-locked	Fine to medium	Medium	Sawing = Very difficult and good Planing = Difficult and good Sanding = Moderate and good	Resistant	Resistant	Extremely high	Very high	High silica content. The cutting edges get dulled.
30	Bustic Dipholis salicifolia	Dark reddish brown	Flatsawn soft parabolic figure	Very high	Straight	Fine to medium	Medium	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good			Very high	Very high	
31	Guaité Dipholis stevensonii	Dark reddish brown	Indistinct	Very high	Straight	Medium	Medium	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good			Very high	Very high	
33	Genipa Genipa americana	Light yellowish brown pinkish or blue overcast	Numerous bands of darker coloured wood striped figure	Medium	Straight to inter-locked	Fine	Medium	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good	Susceptible	Permeable	High	Medium	
35	Cramantee Guarea glabra	Light reddish brown darkening with time	Indistinct	Low to medium	Straight to inter-locked	Medium	Medium	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good	Moderately resistant	Extremely resistant	Medium	Low to medium	A slight fetid odour.
37	Urucurana Hieronyma alchorneoides	Light reddish brown to chocolate brown to dark red	Flatsawn parabolic markings to variation in colour	High	Irregular inter-locked to roey	Coarse	Medium to large	Sawing = Difficult and good Planing = Difficult and poor Sanding = Easy and excellent	Moderately resistant	Moderately resistant	High	High	The poor planing characteristics are due mainly to the roey grain.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Lateral hardness	Grain	Texture	Dimensional movement	Machinability and surface characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
39	Courbaril Hymenaea courbaril	Russet to reddish brown with dark streaks	Pronounced due to growth rings and dark streaks	High	Inter-locked and straight to irregular	Medium to coarse	Medium	Sawing = Difficult and good Planing = Difficult = and fair Sanding = Difficult and good	Resistant	Resistant	Very high	High	Sapwood is permeable to preservatives.
42	Monkey apple Licania platypus	Uniform chocolate brown	Pronounced due to vessel lines	Medium	Inter-locked	Coarse	Small	Sawing = Moderate and good Planing = Difficult and good Sanding = Difficult and good	Moderately resistant	Permeable	High	Medium	Dulls tools rapidly because of high silica content.
44	Black cabbage bark Lonchocarpus castilloi	Dark reddish brown	Flatsawn distinct figure due to parabolic markings	High to very high	Inter-locked	Fine to medium	Medium	Sawing = Moderate and good Planing = Difficult and good Sanding = Easy and good	Highly resistant	Extremely resistant	Very high	High to very high	
47	Tepehuaje Lysiloma acapulcensis	Dark brown with chocolate or reddish grey hues	Pronounced due to vessel lines	Medium	Straight to inter-locked	Medium to coarse	Small	Sawing = Moderate and fair Planing = Easy and fair Sanding = Easy and fair	Resistant	Extremely resistant	Medium	Medium	
48	Tzalam Lysiloma bahamensis	Dark brownish red	Pronounced figure due to parenchyma bands	Medium	Straight to irregular	Medium to coarse	Medium	Sawing = Easy Planing = Easy and fair Sanding = Easy			High	Medium	
49	Fustic Maclura tinctoria	Golden yellow changing to brown or russet with reddish tinge	Indistinct	Very high	Inter-locked to straight	Medium to fine	Small	Sawing = Moderate and good Planing = Moderate and good Sanding = Moderate and good	Resistant	Extremely resistant	Very high	Very high	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Lateral hardness	Grain	Texture	Dimensional movement	Machinability and surface characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
50	Magnolia Magnolia schiedeana	Dark brown	Pronounced due to growth rings that end in a grey band	Medium	Straight	Medium	Medium	Sawing = Easy and good Planing = Easy and fair Sanding = Easy and good		Permeable	Medium	Medium	
51	Sapodilla Manilkara zapota	Dark reddish brown	Indistinct	Very high	Straight	Fine	Small	Sawing = Difficult and good Planing = Moderate and good Sanding = Moderate and good	Highly resistant	Extremely resistant	Extremely high	Very high	
53	Chechem Metopium brownei	Bands of dark reddish brown black, green to pale brown golden hue	Pronounced figure flat and quarter sawn	Very high	Straight to inter-locked	Fine		Sawing = Moderate and good Planing = Easy and good Sanding = Easy and excellent		Extremely resistant	Very high	Very high	
54	Chicharra Mirandaceltis monoica	Reddish brown	Pronounced due to bands of parenchyma	High	Inter-locked	Fine	Small	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Resistant	Extremely resistant	High	Medium to high	
55	Pimientillo Misanteca peckii			Medium	Straight	Medium	Small	Sawing = Easy and fair Planing = Easy and good Sanding = Easy and good			High	Medium	
56	Pajulté Mosquitoxylon jamaicense	Pale brown with greenish or yellowish brown hues	Pronounced due to vessel lines and coloured bands	Medium	Inter-locked	Medium	Small	Sawing = Easy and fair Planing = Easy and fair Sanding = Easy and fair		Extremely resistant	Medium	Medium	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Lateral hardness	Grain	Texture	Dimensional movement	Machinability and surface characteristics	Resistance to dry-wood termites and/or *Lyctus*	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
59	Provision tree *Pachira aquatica*	Pale pink or pale orange	Slight due to vessel lines	Very low	Straight	Medium	Large	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good	Susceptible	Permeable	Medium	Very low	
60	Amaranth *Peltogyne pubescens*	Deep purple turning to dark brown	Indistinct	Very high	Straight wavy to inter-locked	Fine	Medium to large	Sawing = Moderate and good Planing = Moderate and good Sanding = Easy and good	Resistant	Resistant to extremely resistant	Very high	Very high	
65	Pino colorado *Pinus patula*	Pale yellowish brown	Pronounced due to differences in early and late wood	Low	Straight	Medium	Small	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Moderately resistant	Permeable	Medium	Low	
68	Ocote *Pinus teocote*	Yellowish to yellowish brown	Indistinct	Medium	Straight	Medium	Small	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Susceptible	Permeable	Medium	Medium	
69	Jabin *Piscidia communis*	Pale reddish brown	Flat sawn pronounced figure due to parenchyma bands	High	Straight to irregular	Medium	Medium	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good			Very high	High	
70	Barba jolote *Pithecellobium arboreum*	Pale reddish brown	Indistinct	Medium	Inter-locked	Medium to coarse	Medium	Sawing = Easy and fair Planing = Easy and fair Sanding = Easy and fair			High	Medium	
71	Guaciban *Pithecellobium leucocalyx*	Pink with brown vessel lines	Pronounced due to vessel lines	Medium	Inter-locked	Coarse	Medium	Sawing = Easy Planing = Easy and poor Sanding = Easy			Medium	Medium	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Lateral hardness	Grain	Texture	Dimensional movement	Machinability and surface characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
76	Kanisté Pouteria campechiana	Pale greenish brown	Indistinct	High	Straight to irregular	Fine	Large	Sawing = Easy and good Planing = Easy and fair Sanding = Easy and good			Very high	High	
77	Mesquite Prosopis juliflora	Brownish red	Indistinct	High	Straight to irregular	Coarse	Medium to small	Sawing = Moderate and good Planing = Moderate and fair Sanding = Easy and good	Resistant		Very high	High	Sapwood susceptible to Lyctus attack.
81	Oak Quercus acatenangensis	Pale greenish or yellowish brown	Pronounced due to rays and vessel lines	High	Straight	Coarse	Small	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good			High	High	
82	Oak Quercus anglohondurensis	Pale yellowish brown or very pale brown	Pronounced due to contrast of rays	Very high	Straight	Coarse	Large	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good			High	High	
83	Oak Quercus crassifolia	Dark grey or reddish brown	Pronounced due to rays and vessel lines	High	Straight	Coarse	Small	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good			High	High	
84	Encino blanco Quercus germana	Pale greyish yellow or very pale brown	Pronounced due to rays and growth rings	Medium	Straight to wavy	Coarse	Medium to large	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good			High	Medium	
85	Encino roble Quercus rugosa	Pinkish yellow	Pronounced due to rays and vessel lines	Medium	Straight	Coarse	Medium to large	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good			High	Medium	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Lateral hardness	Grain	Texture	Dimensional movement	Machinability and surface characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
86	Oak Quercus skinneri	Dark reddish brown with greyish rays	Pronounced due to vessel lines and growth rings	Very high	Straight	Coarse	Large	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good			Very high	Very high	
89	Chechén blanco Sebastiana longiscuspis	Pinkish white with dark brown specks	Indistinct	Medium	Straight	Medium	Medium	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy			High	Medium	
90	Chacahuanté Sickinga salvadorensis	Pink or red with darker coloured zones on exposure yellow brown	Quarter sawn "sunset" figure dulls on exposure	High	Straight to irregular	Fine	Large	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good		Permeable	High	High	
94	Corazón azul Swartzia cubensis	Dark reddish brown with purplish tinge	Flat sawn distinct parabolic figure	Very high	Straight to irregular	Fine	Medium	Sawing = Moderate and good Planing = Moderate and excellent Sanding = Moderate and good	Resistant		Very high	Very high	Dust irritating to workers.
95	Billy webb Sweetia panamensis	Dark yellowish brown with dark streaks	Quarter sawn distinct narrow ribbon	Very high	Wavy to roe	Fine	Medium	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Resistant		Very high	Very high	
97	Waika chewstick Symphonia globulifera	Yellowish greyish or greenish brown or striped	Has a mealy appearance abundant parenchyma	Medium	Straight inter-locked irregular	Coarse	Medium	Sawing = Easy and good Planing = Easy and poor Sanding = Easy and good	Moderately resistant	Extremely resistant	Medium	Medium	
99	Jolmashté Talauma mexicana	Dark brown with yellowish hue	Indistinct	Low	Straight	Medium	Medium	Sawing = Easy and good Planing = Easy excellent Sanding = Easy and good			Medium	Low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Lateral hardness	Grain	Texture	Dimensional movement	Machinability and surface characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Basic density	Transverse hardness	Observations
100	Guaya Talisia olivaeformis	Pale yellow with greyish brown hues	Indistinct	High	Inter-locked to wavy	Medium to coarse	Medium	Sawing = Difficult Planing = Difficult Sanding = Difficult			Very high	High	
102	Nargusta Terminalia amazonia	Yellowish olive to golden brown reddish brown stripes	Fiddleback figure or stripe or roe figure quarter sawn	High	Inter-locked straight irregular	Medium	Medium to small	Sawing = Easy and good Planing = Easy and good Sanding = Easy and good	Resistant	Extremely resistant	High	High	
103	Bitterwood Vatairea lundelli	Light brown with olive hue	Distinct flat sawn due to parenchyma bands	High	Wavy to inter-locked	Medium to coarse	Medium	Sawing = Easy and good Planing = Easy and fair Sanding = Easy and good	Resistant	Extremely resistant	Medium	High	The sapwood is permeable to preservatives. Dust during machining affects some people.
105	Fiddlewood Vitex gaumeri	Pale yellow with greyish brown hues	Quarter sawn fiddleback weak	High	Inter-locked to irregular	Fine	Medium	Sawing = Easy and excellent Planing = Easy and good Sanding = Easy and good	Susceptible	Resistant	Medium	Medium	The sapwood is permeable to preservatives.
107	Chintoc Wimmeria bartletti	Brown to light reddish brown	Flat sawn parabolic figure due to parenchyma lines	High	Straight	Very fine	Large	Sawing = Difficult and good Planing = Difficult and good Sanding = Difficult and good			Very high	High	
109	Trementino volador Zuelania guidonia	Pale yellow with a reddish hue	Indistinct	High	Straight	Fine	Medium	Sawing = Easy and good Planing = Easy and excellent Sanding = Easy and good		Resistant	High	High	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Should be resistant to abrasion and indentation.
- A smooth and even surface should be obtained after laid and sanded.

- Should be able to take and hold well varnishes and other glossy transparent finishes.
- Preferably should have an attractive colour or grain pattern or figure, especially in the dark coloured woods.
- Preferably the wood should move as little as possible relative to its density with changes in moisture content.
- Must offer guarantee of long term performance from the point of view of resistance to deterioration by insects.

With these requirements the timbers should be within the property limits shown below:-

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = Greater than 0.48 g/cm³.
- Lateral hardness range = Greater than 400 kg, or 3920 N, Air-dry.
- Transverse hardness range = Greater than 500 kg, or 4900 N, Air-dry.
- Grain = Straight or interlocked. In parquet type of floors it does not matter.
- Texture = Medium coarse to fine.
- Dimensional movement = Medium to small.
- Machinability = Easy to plane and sand to good or excellent surfaces.
- Paintability = Should be able to take and hold well varnishes and transparent coatings.
- Heartwood resistant to dry-wood termites and Lyctus; if not, sapwood and heartwood from resistant to permeable to preservative treatment (depending on the risk of attack).

TABLE 9. NON-STRUCTURAL ELEMENTS FOR INTERIORS OF BUILDINGS: Panelling.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Average EMC% for interiors. Appendix 1.
- Recommended standard for softwood appearance grades = NOM-C-1986 grades 1st, 2nd and 3rd Appendix 6.
- Recommended standard for hardwood appearance grades = Appendix 7. Grades 1 and 2.
- All sapwood is considered very susceptible to drywood termites and Lyctus, and together with heartwood that is not RESISTANT or MODERATELY RESISTANT must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Lateral hardness	Observations
2	Alamo plateado Acer skutchii	Reddish brown	Flat sawn pronounced due to growth rings and rays	Sawing = Easy and good Planing = Easy and good Moulding = Easy Sanding = Easy and good	Easy and good		Resistant	Medium	Medium	Straight	Medium	Medium	
3	Coton de caribe Alchornea latifolia	Light brown	Quarter sawn stripes distinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and poor Sanding = Easy and very poor	Easy and excellent	Susceptible	Permeable	Medium to large	Medium to coarse	Straight wavy to inter-locked	Medium	Low	
7	Espave Anacardium excelsum	On exposure russet brown with a golden or reddish cast	Pronounced stripes. Pronounced vessel lines	Sawing = Easy and good Planing = Moderate and poor Moulding = Easy and good Sanding = Easy and very poor	Easy	Resistant	Permeable to moderately resistant	Small	Medium to coarse	Inter-locked	Medium	Low	
12	Cedro espino Bombacopsis quinatum	Light to reddish brown on exposure	Quarter sawn ribbon	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Resistant	Medium	Medium	Straight to inter-locked	Medium	Low to medium	Sapwood is permeable to preservatives.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Lateral hardness	Observations
15	Red gombolimbo Bursera simaruba	White yellowish to light brown	Ribbon weak	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and very poor Sanding = Easy and good	Easy and excellent	Susceptible	Permeable	Small	Fine to medium	Straight to irregular	Low	Low	
17	Santa Maria Calophyllum brasiliense	Pink or yellowish pink to brick red or reddish brown	Quarter sawn stripe ribbon weak	Sawing = Moderate and fair Planing = Moderate and fair Moulding = Moderate and poor Sanding = Moderate and fair	Moderate and very poor	Moderately resistant	Extremely resistant	Medium	Medium	Inter-locked to straight	Medium	Low to medium	
21	Cedar Cedrela odorata	Brown reddish	Flat sawn growth ring roe distinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Sanding = Easy and good	Easy and good	Resistant	Resistant to extremely resistant	Small	Fine to medium	Straight to roe	Medium	Low	
22	Salmwood Cordia alliodora	Yellowish to brown uniform or more or less streaked	Quarter sawn mottle distinct	Sawing = Easy and good Planing = Easy and good Moulding = Easy and poor Sanding = Easy and good	Easy and good	Resistant	Moderately resistant	Medium	Fine to medium	Straight to inter-locked	Medium	Very low to low	Sapwood susceptible to Lyctus attack.
24	Orejuelo Cymbopetalum penduliflorum	Very pale brown	Pronounced due to vessel lines	Sawing = Easy and good Planing = Easy and fair Moulding = Easy Sanding = Easy and good	Easy and fair			Medium	Coarse	Inter-locked	Medium	Very low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Lateral hardness	Observations
27	Sac chacáh Dendropanax arboreus	Cream coloured to greyish yellow	Indistinct	Sawing = Easy and good Planing = Easy and fair Moulding = Easy and fair Sanding = Easy and good	Easy and good	Susceptible	Permeable	Small	Medium	Straight	Medium	Very low	
29	Morototo Didymopanax morototoni	Pale brownish	Weak	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Permeable to moderately resistant	Large	Fine to medium	Straight	Medium	Very low to low	
32	Tubroos Enterolobium cyclocarpum	Brown with various shadings, sometimes reddish tinge	Quarter sawn stripe	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and fair Sanding = Easy and fair	Easy and good	Resistant		Small	Coarse	Inter-locked and straight	Medium	Low	Dust from machining is pungent and irritating to mucous membranes and may cause allergies. Sapwood susceptible to insect attack.
35	Cramantee Guarea glabra	Light red to pink	Quarter sawn stripes mottle	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Sanding = Easy and good	Easy and very poor	Resistant to moderately resistant	Extremely resistant	Medium	Medium	Straight to inter-locked	Medium	Low to medium	
36	Zopo Guatteria anomela	White to pale brown	Pronounced due to rays and axial parenchyma	Sawing = Easy and fair Planing = Easy and excellent Moulding = Easy and very poor Sanding = Easy and good	Easy and good		Permeable	Large	Coarse	Straight	Medium	Low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Lateral hardness	Observations
38	Possumwood Hura crepitans	Pale yellowish brown or pale olive grey	Quarter sawn ribbon distinct	Sawing = Moderate and good Planing = Easy and poor Moulding = Easy and fair Sanding = Easy and fair	Easy and good	Susceptible	Permeable	Small	Medium	Straight to inter-locked	Medium	Low to medium	Chipped and torn grain are encounterd with extreme interlocked grain.
40	Copaia Jacaranda copaia	Dull white to oatmeal colour	Pronounced brown vessel lines	Sawing = Easy and poor Planing = Easy and poor Moulding = Easy and fair Sanding = Easy and fair	Easy and good	Susceptible	Permeable	Medium to large	Medium	Straight to inter-locked	Medium	Low	
43	Liquidambar Liquidambar styraciflua	Greyish to various shades of reddish brown	Quarter sawn stripe distinct	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Extremely resistant	Large	Fine	Inter-locked to irregular	Medium	Low to medium	
46	Yayo Luehea seemannii	Creamy white or pale brown	Quarter sawn stripe indistinct	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible		Small	Medium	Straight to inter-locked	Medium	Medium	
47	Tepehuaje Lysiloma acapulcensis	Dark brown with chocolate or darkish grey hues	Pronounced due to vessel lines	Sawing = Moderate and fair Planing = Easy and fair Moulding = Moderate Sanding = Easy and fair	Easy and good	Resistant	Extremely resistant	Medium to small	Medium to coarse	Straight to inter-locked	Medium	Medium	
50	Magnolia Magnolia schiedeana	Dark brown	Pronounced due to growth rings that end in a grey band	Sawing = Easy and good Planing = Easy and fair Moulding = Easy Sanding = Easy and good	Easy and good		Permeable	Medium	Medium	Straight	Medium	Medium	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Lateral hardness	Observations
59	Provision tree Pachira aquatica	Pale pink or pale orange	Slight due to vessel lines	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and very poor Sanding = Easy and good	Easy and excellent	Susceptible	Permeable	Large	Medium	Straight	Medium	Very low	
61	Aguacate Persea americana	Brown reddish or pinkish	Indistinct	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Moderately resistant	Moderately resistant	Large	Medium to coarse	Straight to irregular	Medium	Low	
62	Pine Pinus spp.	White, pale yellow and brown to reddish brown	Flat sawn parabolic figure due to growth rings	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible to moderately resistant	Permeable	Medium to small	Medium to fine	Straight	Medium	Low to medium	
71	Guacibán Pithecellobium leucocalyx	Pink with brown vessel lines	Pronounced due to vessel lines	Sawing = Easy Planing = Easy and poor Moulding = Easy and fair Sanding = Easy	Easy and fair			Medium	Coarse	Inter-locked	Medium	Medium	
75	Masamorro Poulsonia armata	On exposure brownish or oatmeal	Pronounced due to vessel lines amd interlocked grain	Sawing = Easy and poor Planing = Easy and very poor Moulding = Easy and very poor Sanding = Easy and fair	Easy and very poor	Susceptible	Permeable	Small	Coarse	Straight to inter-locked	Medium	Medium	Dulls tools rapidly because of very high silica content.
78	Amapala Pseudobombax ellipticum	Pale reddish brown	Flat sawn parabolic figure due to parenchyma bands	Sawing = Easy and fair Planing = Easy and excellent Moulding = Easy and fair Sanding = Easy and good	Easy and very poor		Moderately resistant	Medium	Fine to medium	Straight to irregular	Medium	Very low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Lateral hardness	Observations
79	Palo de sangre Pterocarpus hayesii	Yellowish to whitish	Pronounced due to vessel lines	Sawing = Easy and good Planing = Easy and good Moulding = Easy and poor Sanding = Easy and good	Easy and excellent		Permeable	Medium	Medium to coarse	Straight to irregular	Medium	Very low	
80	Molinillo Quararibea funebris	Creamy yellowish or brownish	Quarter sawn stripe indistinct	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy Sanding = Easy and fair	Easy and fair		Permeable	Medium to small	Fine to medium	Slightly inter-locked	Medium	Low	
87	Primavera Roseodendron donnell-smithii	Cream, yellowish white to pale yellowish brown	Quarter sawn stripe roe variable	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible		Small	Medium	Straight to inter-locked	Medium	Low	
88	Quamwood Schizolobium parahybum	Light brown reddish	Quarter sawn stripe distinct	Sawing = Easy and poor Planing = Easy and good Moulding = Easy and very poor Sanding = Easy and fair	Easy and excellent	Susceptible	Extremely ressistant	Small	Medium to coarse	Inter-locked	Low	Very low	
89	Chechén blanco Sebastiana longiscuspis	Pinkish white with dark brown specks	Indistinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent	Easy and very poor			Medium	Medium	Straight	Medium	Medium	
91	Negrito Simarouba glauca	Whitish or straw coloured with occasional oily streaks	Indistinct	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Permeable	Medium	Medium	Straight	Medium	Low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Nailing and splitting characteristics	Resistance to dry-wood termites and/or *Lyctus*	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Lateral hardness	Observations
92	Hogplum *Spondias mombin*	Cream to buff coloured	Indistinct	Sawing = Easy and good Planing = Easy and good Moulding =Easy and very poor Sanding = Easy and good	Easy and excellent	Moderately resistant	Permeable to moderately resistant	Small	Medium to coarse	Straight to inter-locked	Medium	Low	
96	Mahogany *Swietenia macrophylla*	Brown reddish to yellowish	Flat-quarter sawn, stripe variety, distinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and fair Sanding = Easy and good	Easy and good	Moderately resistant	Extremely resistant	Small	Fine to medium	Straight to inter-locked	Medium	Low	
97	Waika chewstick *Symphonia globulifera*	Yellowish greyish or greenish brown or stripes in shades	Has a mealy appearance because of abundant parenchya	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and fair Sanding = Easy and good	Easy and good	Moderately resistant	Extremely resistant	Medium	Coarse	Straight to irregular	Medium	Medium	
98	Apamate *Tabebuia rosea*	Light brown with a greyish or more common golden hue	Quarter sawn stripe and flat sawn feather figure	Sawing = Easy and good Planing = Easy and good Moulding = Easy and excellent Sanding = Easy and excellent	Easy and fair	Susceptible	Permeable	Small	Medium	Straight to inter-locked	Medium	Low	
99	Jolmashté *Talauma mexicana*	Dark brown with yellowish hue	Indistinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and poor Sanding = Easy and good	Easy and good			Medium	Medium	Straight	Medium	Low	
101	Southern wild mahogany *Tapirira guianensis*	Brownish pink	Flat sawn parabolic figure due to growth rings	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Moderately resistant	Medium	Fine	Straight	Medium	Low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Nailing and splitting characteristics	Resistance to dry-wood termites and/or Lyctus	Amenability to preservative treatment	Dimensional movement	Texture	Grain	Basic density	Lateral hardness	Observations
103	Bitterwood Vatairea lundellii	Light brown with olive hue	Distinct flat sawn figure due to parabolic bands	Sawing = Easy and good Planing = Easy and fair Moulding = Easy and very poor Sanding = Easy and fair	Easy and fair	Resistant	Extremely resistant	Medium	Medium to coarse	Wavy to inter-locked	Medium	High	The sapwood is permeable to preservatives. Dust during machining affects some people.
104	Banak Virola koschnyi	On exposure pinkish golden brown or deep reddish brown	Indistinct	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Permeable	Large	Medium to coarse	Straight	Medium	Low	
106	Yemeri Vochysia hondurensis	Dull uniform pink, pinkish brown or golden brown	Indistinct	Sawing = Easy and fair Planing = Easy and poor Moulding = Easy and poor Sanding = Easy and fair	Easy and excellent	Susceptible	Permeable	Medium	Medium	Inter-locked	Medium	Low	Vertical traumatic gum ducts may occur occasionally and are sometimes considered as a defect.
108	Prickly yellow Zanthoxylum beliziense	Pale brown	Flat sawn brown coloured lines of parenchyma	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Sanding = Easy and good	Easy and good	Susceptible	Permeable	Small	Coarse	Narrowly inter-locked	Medium	Medium	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Preferably should have a distinct colour, figure or grain pattern, even contrasting colours between heartwood and sapwood.
- Once in place should distort little, and have small dimensional change with variations in moisture content.
- Texture is not important, or grain direction.
- Machinability should not be too difficult and the surfaces obtained should be fairly smooth and even.
- Should not be too difficult to nail or to glue.
- Should be able to apply paints mainly varnishes or transparent coatings.
- Must offer guarantee of long term performance from the point to view of resistance of deterioration by insects.
- Low tendency to resin exudation and staining by extractives.

With these requirements the timbers should be within the property limits shown below:

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = 0.30–0.56 g/cm³.
- Grain = The whole range.
- Texture = The whole range.
- Colour and figure = Preferably attractive patterns.
- General machinability = Easy or difficult with poor to excellent surfaces, except for planing, moulding and sanding which should provide a good to excellent surface.
- Dimensional movement = Preferable medium to small.
- Resistance to splitting by nails = Fair to excellent.
- Paintability = Should take and hold well varnishes and transparent finishes.
- Heartwood resistant to drywood termites if not, sapwood and heartwood from resistant to permeable to preservative treatment (depending on the risk of attack).
- Lateral hardness range = 150–600 kg, or 1470–5880 N, Air-dry.

TABLE 10. HIGH QUALITY FURNITURE, AND VISIBLE PARTS OF HIGH QUALITY UPHOLSTERED FURNITURE.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Average EMC% for interiors Appendix 1.
- Recommended standard for softwood appearance grades = NOM-C-18-1986 grades select and 1st. Appendix 3.
- Recommended standard for hardwood appearance grades = Appendix 7, grades 1st and 2nd.
- All sapwood is considered very susceptible to dry-wood termites and Lyctus, and together with heartwood that is not RESISTANT or MODERATELY RESISTANT must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
2	Alamo plateado *Acer skutchii*	Reddish brown	Flat sawn pronounced due to growth rings and rays	Sawing = Easy and good Planing = Easy and good Moulding = Easy Mortising = Easy Sanding = Easy and good	Easy and good	Medium	Medium	Straight	Medium	Medium	Medium	Low	Medium	
6	Luin *Ampelocera hottlei*	Pale yellow with dark lines as edges of "growth" rings	Indistinct	Sawing = Easy Planing = Easy and poor Moulding = Easy and excellent Mortising = Easy Sanding = Easy	Easy and very poor	Medium	High	Straight to inter-locked	Medium	Medium	Medium	Medium	High	
7	Espave *Ancardium excelsum*	On exposure russet brown with a golden or reddish cast	Pronounced stripe. Pronounced vessel lines	Sawing = Easy and good Planing = Moderate and poor Moulding = Easy and good Mortising = Easy and good Sanding = Moderate and poor	Easy	Medium to coarse	Medium	Inter-locked	Small	Low	Low	Low	Low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
8	Angelin Andira inermis	Yellowish brown to reddish brown	Bands of light coloured parenchyma give distinct figure	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and fair Mortising = Easy and good Sanding = Easy and excellent	Easy and fair	Coarse	High	Straight to inter-locked	Small	Very high	Medium to high	Medium	High	Toxic dust. Sapwood susceptible to Lyctus attack.
9	Mylady Aspidesperma megalocarpon	Light pinkish brown or pale yellowish brown	Indistinct	Sawing = Easy and good Planing = Difficult and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Moderate and good	Medium to fine	Very high	Straight to inter-locked	Medium	Very high	Medium to high	High to very high	High	
10	Palo mulato Astronium graveolens	Brown red or dark reddish brown with black stripes	Striking figure due to irregular longitudinal dark bands	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Very high	Inter-locked	Small	High	High	High	High	
12	Cedro espino Bombacopsis quinatum	Light to reddish brown on exposure	Quarter sawn ribbon	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium	Straight to inter-locked	Medium	Medium	Low	Low to medium	Low to medium	
13	Breadnut Brosimum alicastrum	Yellowish white, around knots reddish	Indistinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Fine	High	Straight to inter-locked	Small to medium	Very high	Very high	High	High	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
16	Partridge wood Caesalpinia granadillo	Dark red to chocolate brown or nearly black pencil stripes of parenchyma	Partridge figure distinct	Sawing = Difficult and good Planing = Difficult and good Moulding = Difficult and good Mortising = Difficult and good Sanding = Difficult and good	Moderate and good	Medium	Extremely high	Straight to inter-locked to irregular	Medium to large	High	High	High	High	
18	Degame Calycophyllum candidissimum	Light brown to oatmeal colour	Indistinct	Sawing = Difficult and fair Planing = Moderate and fair Moulding = Moderate and good Mortising = Moderate and good Sanding = Moderate and good	Easy and good	Fine	High	Straight to irregular to inter-locked	Medium	Medium	Medium to high	Medium to high	Medium to high	
21	Cedar Cedrela ordorata	Brown reddish	Flat sawn growth ring roe distinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and good	Fine to medium	Medium	Straight to roe	Small	Low	Low	Low	Low	
22	Salmwood Cordia alliodora	Yellowish to brown uniform or more or less streaked	Quarter sawn mottle distinct	Sawing = Easy and good Planing = Easy and good Moulding = Easy and poor Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium	Straight to inter-locked	Medium	Medium	Low	Low to medium	Very low to low	Sapwood susceptible to Lyctus attack.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
23	Ziricote Cordia dodecandra	Dark brown	Quarter sawn stripe. Flat sawn differences in colour.	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and good Mortising = Easy and good Sanding = Easy and excellent	Moderate and fair	Fine	Very high	Straight to irregular	Medium to small	Medium	Medium	High	High	
33	Genipa Genipa americana	Light yellowish brown pinkish or blue overcast	Numerous bands of darker coloured wood striped figure	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and excellent Sanding = Easy and good	Easy and fair	Fine	High	Straight to inter-locked	Medium	Medium	Medium	Medium	Medium	
35	Cramantee Guarea glabra	Light reddish brown darkening with time	Indistinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium	Straight to inter-locked	Medium	Low to medium	Low to medium	Low	Low to medium	
36	Zopo Guatteria anomela	White to pale brown	Pronounced due to rays and longitudinal parenchyma	Sawing = Easy and fair Planing = Easy and excellent Moulding = Easy and very poor Mortising = Easy Sanding = Easy and good	Easy and excellent	Coarse	Medium	Straight	Small to medium	Low	Medium	Low	Low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
39	Courbaril *Hymenaea courbaril*	Russet to to reddish brown with dark streaks	Pronounced due to growth rings and and dark streaks	Sawing = Difficult and good Planing = Difficult and fair Moulding = Diffciult and good Mortising = Difficult and good Sanding = Difficult and good	Easy and good	Medium to coarse	Very high	Inter-locked and straight to irregular	Medium	Medium to high	High	Medium	High	
45	Palo gusana *Lonchocarpus hondurensis*	Reddish brown with dark reddish brown specks	Pronounced due to vessel lines and parenchyma	Sawing = Easy Planing = Easy and good Moulding = Easy and fair Mortising = Easy Sanding = Easy	Easy and excellent	Medium to coarse	High	Straight to irregular to inter-locked	Medium	High	High	High	High	
46	Yayo *Luehea seemannii*	Creamy white or pale brown	Quarter sawn stripe indistinct	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good		Medium	Medium	Straight to inter-locked	Small	High	Medium	Medium	Medium	
47	Tepehuaje *Lysiloma acapulcensis*	Dark brown with chocolate or reddish grey hues	Pronounced due to vessel lines	Sawing = Moderate and fair Planing = Easy and fair Moulding = Moderate Mortising = Easy Sanding = Easy and fair	Easy and good	Medium to coarse	Medium	Straight to inter-locked	Medium to small	Medium	Medium	Medium	Medium	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
48	Tzalam Lysiloma bahamensis	Dark brownish red	Pronounced figure due to parenchyma bands	Sawing = Easy and good Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy	Easy and good	Medium	High	Straight and irregular	Medium	Medium	Medium	Medium	Medium	
49	Fustic Maclura tinctoria	Golden yellow changing to brown or russet with reddish tinge	Indistinct	Sawing = Moderate and good Planing = Moderate and good Moulding = Moderate and good Mortising = Moderate and good Sanding = Moderate and good	Easy and good	Medium to fine	Very high	Inter-locked to straight	Small	Medium to high	Medium to high	Medium high	Very high	
50	Magnolia Magnolia schiedeana	Dark brown	Pronounced due to growth rings that end in a grey band	Sawing = Easy and good Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy and good	Easy amd good	Medium	Medium	Straight	Medium	Medium	Medium	Low	Medium	
52	Zacuayum Matayba oppositifolia	Pinkish brown	Without figure	Sawing = Easy and good Planing = Easy and good Moulding = Easy Mortising = Easy Sanding = Easy and good	Easy and fair	Medium to fine	High	Straight	Medium	Very high	High	High	High	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
53	Chechem *Metopium brownei*	Bands of dark reddish brown black, green to pale brown golden hue	Pronounced figure flat and quarter sawn	Sawing = Moderate and good Planing = Easy and good Moulding = Easy Mortising = Easy Sanding = Easy and excellent	Easy and good	Fine	Very high	Straight to inter-locked to variable		High	High	High	Very high	Resin exudation after drying.
55	Pimientillo *Misanteca peckii*			Sawing = Easy and fair Planing = Easy and good Moulding = Easy and excellent Mortising = Easy Sanding = Easy and good	Easy and fair	Medium	High	Straight	Small	High	High	Medium	Medium	
56	Pajulté *Mosquitoxylon jamaicense*	Pale brown with greenish or yellowish brown hues	Pronounced due to vessel lines and coloured bands	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy and fair	Easy and fair	Medium	High	Inter-locked	Medium	Medium	Medium	Medium	Medium	
57	Balsamo *Myroxylon balsamum*	On exposure deep red or some-what purplish striped	Quarter sawn stripe distinct	Sawing = Moderate and good Planing = Moderate and good Moulding = Moderate and good Mortising = Moderate and good Sanding = Moderate and good	Easy and fair	Medium	Very high	Straight to roey to inter-locked	Small	High	Medium to high	Medium to high	High	Dulls cutting edges.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
60	Amaranth Peltogyne pubescens	Deep purple turning to dark brown	Indistinct	Sawing = Moderate and good Planing = Moderate and good Moulding = Easy and good Mortising = Difficult and fair Sanding = Easy and good	Moderate and good	Fine to medium	Very high	Straight to wavy roe to inter-locked	Medium	Very high	Medium to high	Medium to high	Very high	
63	Ayacahuite Pinus ayacahuite	White to pale brown with pink hue	Slight due to growth rings	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium to fine	Medium	Straight	Small	Medium	Low	Medium	Low	
66	Ponderosa pine Pinus ponderosa	Yellowish to reddish brown	Difference between early and latewood	Sawing = Easy and excellent Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and excellent Sanding = Easy and excellent	Easy and good	Medium	Medium	Straight	Small to medium	Low	Low	Low	Low	
67	Pine Pinus pseudostrobus	White to pale brown with pink hue	Slight due to growth rings	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium to fine	Medium	Straight	Small	Low	Low	Medium	Low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
70	Barba jolote Pithecellobium arboreum	Pale reddish brown	Indistinct	Sawing = Easy and good Planing = Easy and fair Moulding = Easy and very poor Mortising = Easy and fair Sanding = Easy and fair	Easy and fair	Medium to coarse	High	Inter-locked	Medium	Medium	High	Medium	Medium	
71	Guaciban Pithecellobium leucocalyx	Pink with brown vessel lines	Pronounced due to vessel lines	Sawing = Easy Planing = Easy and poor Moulding = Easy and fair Mortising = Easy Sanding = Easy	Easy and excellent	Coarse	Medium	Inter-locked	Medium	Low	Medium	Low	Medium	
73	Panama rosewood Platymiscium polystachyum		Stripe distinct			Fine to medium	Extremely high	Straight roe and inter-locked	Small	Medium	Medium to high	Medium to high	High	
74	Granadillo Platymiscium yucatanum	Pale brown reddish	Pronounced figure flat sawn due to parenchyma bands	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and fair Sanding = Easy and excellent	Easy and good	Medium	Medium	Straight to inter-locked	Medium	Medium	Medium	High	Medium	
77	Mesquite Prosopis juliflora	Brownish red	Indistinct	Sawing = Moderate and good Planing = Moderate and fair Moulding = Moderate Mortising = Moderate Sanding = Easy and good	Moderate and good	Coarse	High	Straight to irregular	Medium to small	High	High	High	High	Sapwood susceptible to Lyctus attack.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
78	Amapola Pseudobombax ellipticum	Pale reddish brown	Flat sawn parabolic figure due to parenchyma bands	Sawing = Easy and fair Planing = Easy and excellent Moulding = Easy and fair Mortising = Easy Sanding = Easy and good	Easy and excellent	Fine to medium	Medium	Straight to irregular	Medium	Very low	Low	Low	Very low	
80	Molinillo Quararibea funebris	Cream yellowish	Indistinct	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy and fair	Easy and good	Fine	Medium	Straight to inter-locked	Small	Medium	Low	Low	Low	
81	Oak Quercus acatenanguensis	Pale greenish or yellowish brown	Pronounced due to rays and vessel lines	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Coarse	High	Straight	Small	Medium	Medium	Medium	High	
83	Oak Quercus crassifolia	Dark grey or reddish brown	Pronounced due to rays and vessel lines	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Coarse	High	Straight	Small	Medium	Medium	Medium	High	
84	Encino blanco Quercus germana	Pale greyish yellow or very pale brown	Pronounced due to rays and growth rings	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and fair Sanding = Easy and good	Easy and good	Coarse	High	Straight to wavy	Medium	Medium	Medium	Low	Medium	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
87	Primavera Roseodendron donnell-smithii	Cream yellowish white to pale yellowish brown	Quarter sawn stripe roe variable	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium	Straight to inter-locked	Small	Low	Low	Low	Low	
91	Negrito Simarouba glauca	Whitish or straw coloured with occasional oily streaks	Indistinct	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Medium	Medium	Straight	Medium	Low	Low	Low	Low	
96	Mahogany Swietenia macrophylla	Brown reddish to yellowish	Flat-quarter sawn stripe variety distinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and fair Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Fine to medium	Medium	Straight to inter-locked	Small	Low to medium	Low	Low	Low	
97	Waika chewstick Symphonia globulifera	Yellowish-greyish or greenish brown or striped	Has a mealy appearance abundance of parenchyma	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and fair Mortising = Easy and good Sanding = Easy and good	Easy and fair	Coarse	Medium	Straight to irregular	Medium	High to very high	High to very high	High	High	
98	Apamate Tabebuia rosea	Light brown with a greyish or more commonly golden hue	Quarter sawn stripes and flat sawn feather figure	Sawing = Easy and good Planing = Easy and good Moulding = Easy and excellent Mortising = Easy and excellent Sanding = Easy and excellent	Easy and good	Medium	Medium	Straight to inter-locked	Small	Medium	Low to medium	Medium	Low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
99	Jolmashté Talauma mexicana	Dark brown with yellowish hue	Indistinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and poor Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Medium	Medium	Straight	Medium	High	High	Medium	Low	
101	Southern wild mahogany Tapirira guianensis	Brownish pink	Flat sawn parabolic figure due to growth rings	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Fine	Medium	Straight	Medium	Medium to high	Low to medium	Medium	Low	
102	Nargusta Terminalia amazonia	Yellowish olive to golden brown, reddish brown stripes	Quarter sawn stripe, wavy fiddleback variable	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and fair	Medium	High	Inter-locked to straight to irregular	Medium to small	High	High	High	High	
103	Bitterwood Vatairea lundellii	Light brown	Indistinct	Sawing = Easy and good Planing = Easy and fair Moulding = Easy and very poor Mortising = Easy and fair Sanding = Easy and fair	Easy and good	Medium to coarse	High	Wavy to inter-locked	Medium	High	High	High	High	Dust during machining affects some people.
105	Fiddlewood Vitex gaumeri	Pale yellow with greyish brown hues	Quarter sawn fiddleback weak	Sawing = Easy and excellent Planing = Easy and good Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and fair	Fine	Medium	Inter-locked to irregular	Medium	High	High	High	High	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Screwing and splitting characteristics	Texture	Basic density	Grain	Dimensional movement	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
106	Yemeri Vochysia hondurensis	Dull uniform pink pinkish brown or golden brown	Indistinct	Sawing = Easy and fair Planing = Easy and poor Moulding = Easy and poor Mortising = Easy and fair Sanding = Easy and fair	Easy and excellent	Medium	Medium	Inter-locked	Medium	Low	Low to medium	Low	Low	Vertical traumatic gum ducts may occur and sometimes considered defects.
109	Trementino Zuelania guidonia	Pale yellow with a reddish hue	Indistinct	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy Sanding = Easy and good	Easy and very poor	Fine	High	Straight	Medium	High	High	High	High	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to be worked with hand and power machines with little difficulty to obtain fine smooth surfaces of high quality
- Able to take stresses with a convenient weight to strength ratio
- Able to take finishes such as paints and varnishes and in many cases be able to be highly polished
- Able to be joined with common adhesives and common furniture fastners
- Coarse textured and heavy species, are not as preferred as the lighter and more even textured ones
- Must offer guarantee of long term performance from the point of view of strength and resistance to deterioration by insects
- Low tendency to resin exudation and staining by extractives

With these requirements the timbers should be within the property limits shown below:-

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = 0.40-0.65 g/cm³.
- MOE range = 85000-150000 kg/cm², or 8330-14700 N/mm², Air-dry.
- MOR range = 500-1350 kg/cm², or 49-132 N/mm².
- Crushing strength = 350-700 kg/cm², or 34-69 N/mm², Air-dry.
- Interal hardness = 250-800 kg, or 2450-7840 N, Air-dry.
- Resistance to splitting by nails and screws = Good to excellent.
- Easy to glue, nail and screw.
- Texture = Medium to fine.
- Dimensional movement = Medium to small.
- Grain = Straight. For special purposes interlocked, wavy, curly and roe.
- General machinability = Easy and good to excellent. That is easy to saw, plane, mould, sand, bore, rout, mortise with good to excellent surfaces.
- Paintability = Should take and hold finishes well to a high polish.
- Heartwood resistant to dry-wood termites and Lyctus if not sapwood and heartwood from resistant to permeable to preservative treatment (depending on the risk of attack).

TABLE 11. UTILITY QUALITY FURNITURE, AND VISIBLE PARTS OF UTILITY QUALITY UPHOLSTERED FURNITURE.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Average EMC % for interiors. Appendix 1.
- Recommended standard for pine appearance grades = NOM C - 18 - 1986. Appendix 6, grades 1st and 2nd.
- Recommended standard for hardwood appearance grades = Appendix 7, grades 1, 2 and 3.
- In addition to the species listed here, those of table 10 can also be used, when lower grades of lumber can be obtained or if the price of the lumber suits the manufacturer.
- All sapwood is considered very susceptible to dry-wood termites and Lyctus, and together with heartwood that is not RESISTANT or MODERATELY RESISTANT must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations coloumn.

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Colour of heartwood	Texture	Figure pattern and occurrence	Dimensional movement	Basic density	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
1	Fir Abies sp.	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Creamy white with purplish tinge	Medium	Flatsawn pronounced due to early and later wood	Medium to small	Low	Straight	Low	Low	Low	Low	
4	Aile Alnus acuminata	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and good Mortising = Easy and good Sanding = Easy and excellent	Easy and good	Pale pink	Fine to medium	Soft to pronounced due to rays and growth rings	Small	Medium	Straight	Low	Low	Low	Low	
17	Santa Maria Calophyllum brasiliense	Sawing = Moderate and fair Planing = Moderate and fair Moulding = Moderate and poor Mortising = Moderate and good Sanding = Moderate and fair	Easy and good	Pink or yellowish pink to brick red or reddish brown	Medium	Quatersawn stripe, ribbon weak	Medium	Medium	Inter-locked to straight	Medium	Low to medium	Medium to high	Low to medium	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Colour of heartwood	Texture	Figure pattern and occurrence	Dimensional movement	Basic density	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
19	Bastard Mahogany *Carapa guianensis*	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Very variable on exposure dark salmon to reddish brown	Medium to coarse	Distinct	Small	High	Straight to inter-locked	Medium	Medium	High	Low to medium	
32	Tubroos *Enterolobium cyclocarpum*	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy and fair Mortising = Easy and fair Sanding = Easy and fair	Easy and good	Brown with various shadings, sometimes reddish tinge	Coarse	Quarter-sawn stripe	Small	Medium	Inter-locked and straight	Low	Low	Very low to low	Low	
38	Possumwood *Hura crepitans*	Sawing = Moderate and good Planing = Easy and poor Moulding = Easy and fair Mortising = Easy and fair Sanding = Easy and fair	Easy and good	Pale yellowish brown or or pale olive grey	Medium	Quatersawn ribbon distinct	Small	Medium	Straight to inter-locked	Low	Low	Very low to low	Low to medium	Chipped and torn grain are encountered with extreme interlocked grain.
40	Copaia *Jacaranda copaia*	Sawing = Easy and poor Planing = Easy and poor Moulding = Easy and fair Mortising = Easy and fair Sanding = Easy and fair	Easy and good	Dull white to oatmeal colour	Medium	Prominent brown vessel lines	Medium to large	Medium	Straight to inter-locked	Low	Low to medium	Low to medium	Low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Colour of heartwood	Texture	Figure pattern and occurrence	Dimensional movement	Basic density	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
42	Monkey apple Licania platypus	Sawing = Difficult and good Planing = Difficult and good Moulding = Difficult and good Mortising = Difficult and good Sanding = Diffcult and good	Easy and good	Uniform chocolate brown	Coarse	Pronounced due to vessel lines	Small	High	Inter-locked	Small	Medium	Medium	Medium	Dulls tools rapidly because of high silica content.
61	Aguacate Persea americana	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Brown reddish or pinkish	Medium to coarse	Indistinct	Large	Medium	Straight to irregular	Low	Low	Low	Low	
62	Pine Pinus spp.	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	White pale yellowish brown to reddish brown	Medium to fine	Flatsawn parabolic figure due to growth rings	Medium to small	Medium	Straight	Medium	Medium medium	Low to medium	Low to medium	
79	Palo de sangre Pterocarpus hayesii	Sawing Easy and good Planing = Easy and good Moulding = Easy and poor Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Yellowish to whitish	Medium to coarse	Indistinct	Medium	Medium	Straight to irregular	Low	Low	Low	Very low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Colour of heartwood	Texture	Figure pattern and occurrence	Dimensional movement	Basic density	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
80	Molinillo Quararibea funebris	Sawing = Easy and fair Planing = Easy and fair Moulding = Easy Mortising = Easy Sanding = Easy and fair	Easy and good	Creamy yellowish	Fine to medium	Figure indistinct	Medium	Medium	Slightly inter-locked	Medium	Low	Low	Low	
89	Chechén blanco Sebastiana longiscuspis	Sawing = Easy and good Planing = Easy and excellent Moulding = Easy and excellent Mortising = Easy and good Sanding = Easy and good	Easy and fair	Pinkish white with dark brown specks	Medium	Indistinct	Medium	High	Straight	High	High	Medium	Medium	
92	Hogplum Spondias mombin	Sawing = Easy and good Planing = Easy and good Moulding = Easy and very poor Mortising = Easy and good Sanding = Easy and good	Easy and excellent	Cream to buff coloured	Medium to coarse	Indistinct	Small	Medium	Straight to inter-locked	Low	Low	Low	Low	
93	Bellota Sterculia apetala	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy	Light brown reddish brown or yellowish brown	Medium to coarse	Pronounced due to rays and growth rings	Medium to small	Low	Straight	Very low	Low	Low	Low	
104	Banak Virola koschnyi	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	On exposure pinkish to golden brown or deep reddish brown	Medium to coarse	Indistinct	Large	Medium	Straight	Medium to high	Low to medium	Low	Low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Screwing and splitting characteristics	Colour of heartwood	Texture	Figure pattern and occurrence	Dimensional movement	Basic density	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Observations
108	Prickly yellow Zanthoxylum beliziense	Sawing = Easy and good Planing = Easy and good Moulding = Easy and good Mortising = Easy and good Sanding = Easy and good	Easy and good	Pale brown	Coarse	Flatsawn brown coloured lines of of parenchyma	Small	Medium	Narrowly inter-locked	Medium	Medium	Medium	Medium	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to be worked with hand and power machines, with moderate or little difficulty to obtain smooth surfaces of good to high quality.
- Able to take stresses with a convenient strength to weight ratio.
- In many instances able to take stains well.
- Able to take finishes well such as paints and varnishes.
- Should be quite dimensionally stable with variations in its moisture content.
- Able to be joined with common adhesives and common furniture fastners.
- Must offer guarantee of long term performance from the point of view of strength and resistance to deterioration by insects.
- Low tendency to resin exudation and staining by extractives.

With these requirements the timbers should be within the property limits shown below:-

- Density range (OD WT/G Vol.) = 0.38-0.65 gr/cm^3.
- MOE range = 71000-150000 kg/cm^2, or 6960-14700 N/mm^2, Air-dry.
- MOR range = 400-1350 kg/cm^2, or 39-132 N/mm^2, Air-dry.
- Crushing strength = 300-700 kg/cm^2, or 29-69 N/mm^2, Air-dry.
- Lateral hardness = 200-800 kg, or 1970-7840 N, Air-dry.
- Resistance to splitting by nails and screws = Good to excellent.
- Easy to nail, glue and screw.
- Texture = The whole range.
- Grain = Straight, interlocked - straight.
- Dimensional movement = Medium to small.
- General machinability = Easy and fair to excellent. That is easy to saw, plane, mould, sand, bore, root, moisture with fair to excellent surfaces.
- Finishing characteristics = Should stain easily and take and hold well paints and varnishes.
- Heartwood resistant to drywood termites and Lyctus
  if not; sapwood and heartwood from resistant to permeable to preservative treatment (depending on the risk of attack).

TABLE 12. HIGH AND UTILITY QUALITY FURNITURE: Covered up frames of upholstered pieces.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Average EMC % for interiors Appendix 1.
- Recommended standard for softwood appearance grades = NOM-C-18-1986 grades 2nd and 3rd. Appendix 6.
- Recommended standard for hardwood appearance grades = Appendix 7. 1-5.
- All sapwood is considered very susceptible to drywood termites and Lyctus, and together with heartwood that is not RESISTANT or MODERATELY RESISTANT must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Resistance to drywood termites and /or Lyctus	Amenability to preservative treatment	Nailing and splitting characteristics	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Machinability and surface characteristics	Observations
1	Fir Abies sp.	Susceptible	Permeable	Easy and good	Straight	Low	Low	Low	Low	Low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
3	Coton de caribe Alchornea latifolia	Susceptible	Permeable	Easy and excellent	Straight wavy to inter-locked	Medium	Low	Low	Low	Low	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy and good	
7	Espave Anacardium excelsum	Resistant	Permeable to moderately resistant	Easy	Inter-locked	Medium	Low	Low	Low	Low	Sawing = Easy and good Planing = Moderate and poor Mortising = Easy and good	
15	Red gombolimbo Bursera simaruba	Susceptible	Permeable	Easy and excellent	Straight to irregular	Medium	Low	Low	Low	Low	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy and good	
24	Orejuelo Cymbopetalum penduliflorum			Easy and fair	Inter-locked	Medium	Low	Low	Low	Very low	Sawing = Easy and good Planing = Easy and fair Mortising = Easy	

Timber Number	Species Common name Scientific name	Resistance to drywood termites and /or Lyctus	Amenability to preservative treatment	Nailing and splitting characteristics	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Machinability and surface characteristics	Observations
27	Sac-chacah Dendropanax arboreus	Susceptible	Permeable	Easy and good	Straight	Medium	Low	Low	Low	Very low	Sawing = Easy and good Planing = Easy and fair Mortising = Easy and fair	
29	Morototo Didymopanax morototoni	Susceptible	Permeable moderately resistant	Easy and good	Straight	Medium	Medium to high	Medium to high	Low to medium	Very low to low	Sawing = Easy and fair Planing = Easy and fair Mortising = Easy and fair	
36	Zopo Guatteria anomala		Permeable	Easy and good	Straight	Medium	Low	Medium	Medium	Low	Sawing = Easy and fair Planing = Easy and excellent Mortising = Easy	
38	Possumwood Hura crepitans	Susceptible	Permeable	Easy and good	Straight to inter-locked	Medium	Low	Low to medium	Low	Low to medium	Sawing = Moderate and good Planing = Easy and poor Mortising = Easy and fair	Chipped and torn grain are encountered with extreme interlocked grain.
40	Capaia Jacaranda copaia	Susceptible	Permeable	Easy and good	Straight to inter-locked	Medium	Low	Low to medium	Low to medium	Low	Sawing = Easy and poor Planing = Easy and poor Mortising = Easy and fair	
43	Liquidambar Liquidambar styraciflua	Susceptible	Extremely resistant	Easy and good	Inter-locked to irregular	Medium	Medium to high	Low to high	Low to medium	Low to medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
59	Provision tree Pachira aquatica	Susceptible	Permeable	Easy and excellent	Straight	Medium	Low	Low	Low	Very low	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy	

Timber Number	Species Common name Scientific name	Resistance to drywood termites and /or Lyctus	Amenability to preservative treatment	Nailing and splitting characteristics	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Machinability and surface characteristics	Observations
61	Aguacate Persea americana	Moderately resistant	Moderately resistant	Easy and good	Straight to irregular	Medium	Medium to high	Medium	Low to medium	Low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
62	Pine Pinus spp.	Susceptible	Permeable	Easy and good	Straight	Medium	Medium	Medium	Medium	Low to medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
79	Palo de sangre Pterocarpus hayesii		Permeable	Easy and excellent	Straight to irregular	Medium	Low	low	Medium	Very low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
91	Negrito Simarouba glauca	Susceptible	Permeable	Easy and good	Straight	Medium	Low	Low	Low	Low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
92	Hogplum Spondias mombin	Moderately resistant	Permeable to moderately resistant	Easy and excellent	Straight to inter-locked	Medium	Low	Low	Low	Low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
93	Bellota Sterculia apetala	Susceptible	Permeable	Easy	Straight	Low	Very low	Low	Low	Low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
99	Jolmashté Talauma mexicana			Easy and good	Straight	Medium	High	Medium	Medium	Low	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy	

Timber Number	Species Common name Scientific name	Resistance to drywood termites and /or Lyctus	Amenability to preservative treatment	Nailing and splitting characteristics	Grain	Basic density	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Machinability and surface characteristics	Observations
101	Southern wild mahogany Tapirira guianensis	Susceptible	Moderately resistant	Easy and good	Straight	Medium	Medium to high	Low to medium	Low to medium	Low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
104	Banak Virola koschnyi	Susceptible	Permeable	Easy and good	Straight	Medium	Medium to high	Low to medium	Low to medium	Low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	
106	Yemeri Vochysia hondurensis	Susceptible	Permeable	Easy and excellent	Inter-locked	Medium	Low	Low to medium	Medium	Low	Sawing = Easy and fair Planing = Easy and poor Mortising = Easy and fair	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to be worked with hand tools and power machines with moderate or little difficulty and obtain (very) poor to excellent surfaces.
- Able to take stresses with a convenient strength to weight.
- Able to be joined with common adhesives and common furniture fastners, especially tacks and nails.
- Must offer guarantee of long term performance from the point of view of strength and resistance to deterioration by insects.

With these requirements the timbers should be within the property limits shown below:

PROPERTY LIMITS

- Density range (OD WT/GR Vol.) = 0.38-0.56 g/cm^3.
- MOR range = 71000-100000 kg/cm^2, or 6960-9800 N/mm^2, Air-dry.
- MOR range = 400-900 kg/cm^2, or 39-88 N/mm^2, Air-dry.
- Crushing strength = 300-450 kg/cm^2, or 29-44 N/mm^2, Air-dry.
- Lateral hardness = 200-400 kg, or 1970-3920 N, Air-dry.
- Resistance to splitting by nails and screws = Good to excellent.
- Easy to nail, glue and screw.
- Texture = The whole range.
- Grain = Straight, interlocked - straight.
- General machinability = Easy to moderate, and very poor to excellent, that is, easy to moderate to saw, plane, bore, and mortise with very poor to excellent surfaces.
- Heartwood resistant to drywood termites and Lyctus if not sapwood and heartwood from resistant to permeable to preservative treatment (depending on the risk of attack).

TABLE 13. PACKING BOXES AND CRATES: Crates, packing cases, fruit and vegetable boxes, and pallets.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Average EMC % for exteriors. Appendix 1.
- Recommended softwood appearance grades = NOM-O-18-1986 grades 2nd and 3rd. Appendix 6.
- Recommended hardwood grades = Grades 1-5, Appendix 7.
- All sapwood is considered very susceptible to drywood termites and Lyctus. Preservative treatment is only needed where long service life is required. For food-stuff containers only Boron-Borax preservatives can be used and in all cases dip or brush treatments are adequate.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Nailing and splitting characteristics	Basic density	Machinability and surface characteristics	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Resistance to dry wood termites and/or Lyctus	Amenability to preservative treatment	Observations
1	Fir Abies sp.	Easy and good	Low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight	Low	Low	Low	Low	Susceptible	Permeable	
3	Coton de caribe Alchornea latifolia	Easy and excellent	Medium	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy and good	Straight wavy to inter-locked	Low	Low	Low	Low	Susceptible	Permeable	
7	Espave Anacardium excelsum	Easy	Medium	Sawing = Easy and good Planing = Moderate and poor Mortising = Easy and good	Inter-locked	Low	Low	Low	Low	Resistant	Permeable to moderately resistant	
15	Red gombolimbo Bursera simaruba	Easy and excellent	Medium	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy and good	Straight to irregular	Low	Low	Low	Low	Susceptible	Permeable	
24	Orejuelo Cymbopetalum penduliflorum	Easy and fair	Medium	Sawing = Easy and good Planing = Easy and fair Mortising = Easy	Inter-locked	Low	Low	Low	Very low			

Timber Number	Species Common name Scientific name	Nailing and splitting characteristics	Basic density	Machinability and surface characteristics	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Resistance to dry wood termites and/or Lyctus	Amenability to preservative treatment	Observations
27	Sac-chacah Dendropanax arboreus	Easy and good	Medium	Sawing = Easy and good Planing = Easy and fair Mortising = Easy and fair	Straight	Low	Low	Low	Very low	Susceptible	Permeable	
29	Morototo Didymopanax morototoni	Easy and good	Medium	Sawing = Easy and fair Planing = Easy and fair Mortising = Easy and fair	Straight	Medium to high	Medium to high	Low to medium	Very low to low	Susceptible	Permeable to moderately resistant	
36	Zopo Guatteria anomala	Easy and good	Medium	Sawing = Easy and fair Planing = Easy and excellent Mortising = Easy	Straight	Low	Medium	Medium	Low	Susceptible	Permeable	
38	Possumwood Hura crepitans	Easy and good	Medium	Sawing = Moderate and good Planing = Easy and poor Mortising = Easy and fair	Straight to inter-locked	Low	Low to medium	Low	Low to medium	Susceptible	Permeable	Chipped and torn grain are encountered with extreme interlocked grain.
40	Copaia Jacaranda copaia	Easy and good	Medium	Sawing = Easy and poor Planing = Easy and poor Mortising = Easy and fair	Straight to inter-locked	Low	Low to medium	Low to medium	Low	Susceptible	Permeable	
43	Liquidambar Liquidambar styraciflua	Easy and good	Medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Inter-locked to irregular	Medium to high	Low to high	Low to medium	Low to medium	Susceptible	Extremely resistant	
59	Provision tree Pachira aquatica	Easy and excellent	Medium	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy	Straight	Low	Low	Low	Very low	Susceptible	Permeable	

Timber Number	Species Common name Scientific name	Nailing and splitting characteristics	Basic density	Machinability and surface characteristics	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Resistance to dry wood termites and/or Lyctus	Amenability to preservative treatment	Observations
61	Aguacate Persea americana	Easy and good	Medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight to irregular	Medium to high	Medium	Low to medium	Low	Moderately resistant	Moderately resistant	
62	Pine Pinus spp.	Easy and good	Medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight	Medium	Medium	Medium	Low to medium	Susceptible	Permeable	
71	Guacibán Pithecellobium leucocalyx	Easy and fair	Medium	Sawing = Easy Planing = Easy and fair Mortising = Easy	Inter-locked	Low	Medium	Medium	Medium			
75	Masamorro Poulsonia armata	Easy and very poor	Medium	Sawing = Easy and poor Planing = Easy and very poor Mortising = Difficult and fair	Straight to irregular	Low	Medium	Medium	Very low	Susceptible		Dulls tools rapidly because high silica content.
78	Amapola Pseudobombax ellipticum	Easy and very poor	Medium	Sawing = Easy and fair Planing = Easy and excellent Mortising = Easy	Straight to irregular	Very low	Low	Low	Very low		Moderately resistant	
79	Palo de sangre Pterocarpus hayesii	Easy and excellent	Medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight to irregular	Low	Low	Medium	Very low		Permeable	
80	Molinillo Quararibea funebris	Easy and fair	Medium	Sawing = Easy and fair Planing = Easy and fair Mortising = Easy	Straight to inter-locked	Medium	Low	Low	Low		Permeable	
82	Oak Quercus anglohondurensis	Easy and very poor	High	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight	High	High	High	Very high			

Timber Number	Species Common name Scientific name	Nailing and splitting characteristics	Basic density	Machinability and surface characteristics	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Resistance to dry wood termites and/or Lyctus	Amenability to preservative treatment	Observations
86	Oak Quercus skinneri	Easy and poor	Very high	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy and good	Straight	Very high	High	High	Very high			
88	Quamwood Schizolobium parahybum	Easy and excellent	Low	Sawing = Easy and poor Planing = Easy and good Mortising = Easy and fair	Inter-locked	Very low	Very low	Low	Very low	Susceptible	Extremely resistant	
90	Chacahuanté Sickinga salvadorensis	Easy and very poor	High	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy and good	Straight to irregular	Medium	High	High	High		Permeable	
91	Negrito Simarouba glauca	Easy and good	Medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight	Low	Low	Low	Low	Susceptible	Permeable	
92	Hogplum Spondias mombin	Easy and excellent	Medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight to inter-locked	Low	Low	Low	Low	Moderately resistant	Permeable to moderately resistant	
93	Bellota Sterculia apetala	Easy	Low	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight	Very low	Low	Low	Low	Susceptible	Permeable	
99	Jolmashté Talauma mexicana	Easy and good	Medium	Sawing = Easy and good Planing = Easy and excellent Mortising = Easy and good	Straight	High	Medium	Medium	Low			

Timber Number	Species Common name Scientific name	Nailing and splitting characteristics	Basic density	Machinability and surface characteristics	Grain	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Resistance to dry wood termites and/or Lyctus	Amenability to preservative treatment	Observations
101	Southern wild mahogany Tapirira guianensis	Easy and good	Medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight	Medium to high	Low to medium	Low to medium	Low	Susceptible	Moderately resistant	
104	Banak Virola koschnyi	Easy and good	Medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Straight	Medium to high	Low to medium	Low to medium	Low	Susceptible	Permeable	
106	Yemeri Vochysia hondurensis	Easy and excellent	Medium	Sawing = Easy and fair Planing = Easy and poor Mortising = Easy and fair	Inter-locked	Low	Low to medium	Medium	Low	Susceptible	Permeable	
108	Prickly yellow Zanthoxylum beliziense	Easy and good	Medium	Sawing = Easy and good Planing = Easy and good Mortising = Easy and good	Narrowly inter-locked	Medium	Medium	Medium	Medium	Susceptible	Permeable	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to be worked with hand tools and power machines with moderate or little difficulty and obtain poor to excellent surfaces.
- Able to take stresses with a convenient weight to strength ratio, so as to make the finished product as light as possible.
- Able to be joined with common adhesives and common metal fastners such as nails, screws, etc.

PROPERTY LIMITS

- Density range (OD WT/G Vol.) = 0.38-0.56 g/cm^3.
- MOE range = 71000-100000 kg/cm^2, or 6960-9800 N/mm^2, Air-dry.
- MOR range = 400-900 kg/cm^2, or 39-88 N/mm^2, Air-dry.
- Crushing strength = 300-450 kg/cm^2, or 29-44 N/mm^2, Air-dry.
- Lateral hardness = 200-400 kg, or 1970-3920 N, Air-dry.
- Resistance to splitting by nails and screws = Good to excellent.
- Easy to nail, glue and screw.
- Texture = The whole range.
- Grain = Straight, interlocked-straight.
- General machinability = Easy to moderate, and poor to excellent, that is, easy to moderate to saw, plane, and mortise with poor to excellent surfaces.
- Preferably able to take printing ink.
- When used to carry food-stuffs some species with volatile or highly water soluble extractives should not be used.
- Natural durability of heartwood = Non-durable to very durable or sapwood and perishable heartwood preservative treated - but only with Boron compounds if food is carried.

TABLE 14. TRANSPORT, railway sleepers.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Below 20 per cent.
- Recommended standard for softwoods and hardwoods = Official specifications of railways.
- All sapwood is considered PERISHABLE, and together with the heartwood of those species that is not VERY DURABLE must be preservative treated following the recommendations in Appendix 5.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Screwing and splitting characteristics	Basic density	Dimensional movement	Machinability and surface characteristics	Lateral hardness	Modulus of elasticity	Modulus of rupture	Stress PL compression perpendicular	Observations
9	Mylady Aspidosperma magalocarpon	Non-durable to moderately durable	Permeable	Moderate and good	Very high	Medium	Sawing = Easy and good Boring = Easy and good	High	Very high	Medium to high	Medium	
10	Palo mulato Astronium graveolens	Durable	Resistant to moderately resistant	Easy and good	Very high	Small	Sawing = Easy and good Boring = Easy and good	High	High	High	High	
14	Bullet tree Bucida buceras	Durable to very durable	Resistant	Difficult and poor	Extremely high	Large	Sawing = Difficult and fair Boring = Difficult and good	Very high	High	High	High	
17	Santa Maria Calophyllum brasiliense	Moderate to durable	Extremely resistant	Easy and good	Medium	Medium	Sawing = Moderate and fair Boring = Easy and poor	High	High	Medium to high	Low	
28	Ironwood Dialium guianense	Durable to very durable	Resistant	Easy and good	Extremely high	Medium	Sawing = Very difficult and good Boring = Very difficult and good	Very high	Very high	Very high	Very high	High silica content dulls cutting edges.
30	Bustic Dipholis salicifolia	Moderately durable		Easy and good	Very high	Medium	Sawing = Easy and good Boring = Easy and good	Very high	High	High	High	
31	Guaité Dipholis stevensonii	Durable		Easy and very poor	Very high	Medium	Sawing = Easy and good Boring = Easy and good	Very high	Very high	Very high		

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Screwing and splitting characteristics	Basic density	Dimensional movement	Machinability and surface characteristics	Lateral hardness	Modulus of elasticity	Modulus of rupture	Stress PL compression perpendicular	Observations
33	Genipa Genipa americana	Perishable	Permeable	Easy and fair	High	Medium	Sawing = Easy and good Boring = Easy and good	High	Medium	Medium	Low	
37	Ururucurana Hieronyma alchorneoides	Moderately durable to durable	Resistant	Easy and good	High	Medium to large	Sawing = Difficult and good Boring = Easy and excellent	High	Medium to high	Medium to high	Low	
39	Courbaril Hymenaea courbaril	Durable to very durable	Resistant	Easy and good	Very high	Medium	Sawing = Difficult and good Boring = Difficult and good	High	Medium to high	High	High	
44	Black cabbage bark Lonchocarpus castilloi	Durable	Extremely resistant	Easy and good	Very high	Medium	Sawing = Moderate and good Boring = Moderate and good	High to very high	Very high	Very high	High	
45	Palo gusano Lonchocarpus hondurensis	Durable	Extremely resistant	Easy and excellent	High	Medium	Sawing = Moderate and good Boring = Moderate and good	High	High	High	High	
49	Fustic Maclura tinctoria	Durable to very durable	Extremely resistant	Easy and good	Very high	Small	Sawing = Moderate and good Boring = Moderate and good	Very high	Medium to high	Medium to high	Medium	Sapwood permeable to preservatives if incised.
51	Sapodilla Manilkara zapota	Very durable	Extremely resistant	Moderate and very poor	Extremely high	Small	Sawing = Difficult and good Boring = Difficult and good	Very high	Very high	Very high	High	
54	Chicharra Mirandaceltis monoica	Moderately durable	Extremely resistant	Easy and good	High	Small	Sawing = Easy and good Boring = Easy and fair	High	Medium	Medium	High	
56	Pajulté Mosquitoxylon jamaicense	Durable	Extremely resistant	Easy and fair	Medium	Small	Sawing = Easy and fair Boring = Easy	Medium	Medium	Medium	Medium	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Screwing and splitting characteristics	Basic density	Dimensional movement	Machinability and surface characteristics	Lateral hardness	Modulus of elasticity	Modulus of rupture	Stress PL compression perpendicular	Observations
62	Pine Pinus spp.	Perishable to non-durable	Permeable	Easy and good	Medium	Medium	Sawing = Easy and good Boring = Easy and good	Medium	Medium	Medium	Low to medium	
69	Jabin Piscidia communis	Durable to very durable		Easy and fair	Very high	Medium	Sawing = Easy and good Boring = Easy and good	High	Medium to high	High	High	
70	Barba jolote Pithecellobium arboreum	Durable		Easy and fair	High	Medium	Sawing = Easy and fair Boring = Easy and fair	Medium	Medium	High	High	
71	Guaciban Pithecellobium leucocalyx	Durable		Easy and excellent	Medium	Medium	Sawing = Easy Boring = Easy	Medium	Low	Medium	Medium	
82	Oak Quercus anglohondurensis	Durable		Easy and good	High	Large	Sawing = Easy and good Boring = Easy and good	Very high	High	High	High	
86	Oak Quercus skinneri	Durable to very durable		Easy and poor	Very high	Large	Sawing = Easy and good Boring = Easy and good	Very high	Very high	High	High	
90	Chacahuanté Sickingia salvadorensis	Very durable	Permeable	Easy and very poor	High	Large	Sawing = Easy and good Boring = Easy	High	High	Medium	Medium	
94	Corazón azul Swartzia cubensis	Durable to very durable		Moderate and very poor	Very high	Medium	Sawing = Moderate and good Boring = Moderate and good	Very high	Very high	Very high	Very high	
95	Billy webb Sweetia panamensis	Durable to very durable		Easy and fair	Very high	Medium	Sawing = Easy and good Boring = Easy and good	Very high	Very high	Very high	High	
102	Nargusta Terminalia amazonia	Durable to very durable	Extremely resistant	Easy and fair	High	Medium to small	Sawing = Easy and good Boring = Easy and good	High	High	High	Low to medium	

Timber Number	Species Common name Scientific name	Natural durability of heartwood	Amenability to preservative treatment	Screwing and splitting characteristics	Basic density	Dimensional movement	Machinability and surface characteristics	Lateral hardness	Modulus of elasticity	Modulus of rupture	Stress PL compression perpendicular	Observations
103	Bitterwood Vatairea lundellii	Durable	Extremely resistant	Easy and good	Medium	Medium	Sawing = Easy and good Boring = Easy and good	High	High	High	Medium	The sapwood is permeable to preservatives. Dust during machining affects some people.
109	Trementino volador Zuelania guidonia	Non-durable	Resistant	Easy and very poor	High	Medium	Sawing = Easy and good Boring = Easy	High	High	High	High	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to withstand heavy loads at concentrated points, and absorb heavy vibrations.
- Able to take and hold well metal fastners such as screws and bolts, under heavy loads and vibrations .
- Must offer guarantee of long term performance from the point of view of strength, resistance to deterioration by wood destroying organisms in a high risk situation since the pieces are always in contact with the ground, and resistance to extreme weathering.

With these requirements the timbers should be within the property limits shown below:

PROPERTY LIMITS

- Density range (OD WT/GR Vol.) = Greater than 0.45 g/cm³.
- MOE range = Greater than 80000 kg/cm², or 7850 N/mm², Air-dry.
- MOR range = Greater than 575 kg/cm², or 56 N/mm², Air-dry.
- Lateral hardness = Greater than 270 kg, or 2650 N, Air-dry.
- SPL compression perpendicular to grain = Greater than 56 kg/cm², or 5.5 N/mm², Air-dry.
- Resistance to splitting by screws = Good to excellent.
- Texture = The whole range.
- Grain = The whole range, preferably interlocked.
- General machinability = Difficult to easy, and very poor to excellent, that is, difficult to easy to saw and bore, with poor to excellent surfaces.
- Dimensional movement = Medium to small.
- Natural durability of heartwood = Very durable.

OR

- Preservative treatment = Sapwood and heartwood moderately resistant to permeable

TABLE 15. TOOL HANDLES, IMPACT RESISTANT: Hammer, shovel, axe, etc handles.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Average EMC % for interiors, Appendix 1.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is on the right.

Timber Number	Species Common name Scientific name	Impact resistance	Grain	Texture	Basic density	Machinability and surface characteristics	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Transverse hardness	Dimensional movement	Resistance to termites dry-wood and/or Lyctus	Amenability to preservative treatment
6	Luin Ampelocera hottlei	High	Straight to inter-locked	Medium	High	Sawing = Easy Planing = Easy and good Turning = Easy and excellent Sanding = Easy and good	Medium	Medium	Medium	High	Medium	Medium	Resistant to moderately resistant	Permeable
9	Mylady Aspidosperma megalocarpon	High	Straight to irregular	Medium	High	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	High	High	High	High	High	Medium		Moderately resistant
10	Palo mulato Astronium graveolens	High	Inter-locked	Medium	Very high	Sawing = Difficult and good Planing = Moderate and good Turning = Easy and excellent Sanding = Moderate and good	High	High	High	High	High	Small	Resistant	Resistant to moderately resistant
13	Breadnut Brosimum alicastrum	Very high	Straight to inter-locked	Fine	High	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Very high	Very high	High	High	Very high	Small to medium	Susceptible to moderately resistant	Moderately resistant

Timber Number	Species Common name Scientific name	Impact resistance	Grain	Texture	Basic density	Machinability and surface characteristics	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Transverse hardness	Dimensional movement	Resistance to termites dry-wood and/or Lyctus	Amenability to preservative treatment
17	Santa Mariá *Calophyllum brasiliense*	Very high	Inter-locked	Coarse	Medium	Sawing = Moderate and fair Planing = Moderate and fair Turning = Moderate and poor Sanding = Moderate and fair	High	Medium to high	Medium	High	Medium	Medium	Moderately resistant	Extremely resistant
20	Nogal motudo *Carya ovata*	Very high	Straight	Coarse	High	Sawing = Easy and good Planing = Easy and good Turning = Easy and excellent Sanding = Easy and good	Medium	Medium	Medium	High	Medium to high	Medium to large		Resistant
28	Ironwood *Dialium guianense*	Very high	Straight to inter-locked	Fine to medium	Extremely high	Sawing = Very difficult and good Planing = Difficult and good Turning = Difficult and good Sanding = Moderate and good	Very high	Very high	High	Very high	Very high	Medium	Resistant	Resistant
31	Guaité *Dipholis stevensonii*	Very high	Straight	Medium	Very high	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Very high	Very high	High	Very high	Very high	Medium		

Timber Number	Species Common name Scientific name	Impact resistance	Grain	Texture	Basic density	Machinability and surface characteristics	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Transverse hardness	Dimensional movement	Resistance to termites dry-wood and/or Lyctus	Amenability to preservative treatment
39	Courbaril Hymenaea courbaril	High	Inter-locked and straight to irregular	Fine to medium	Very high	Sawing = Difficult and good Planing = Difficult and fair Turning = Difficult and excellent Sanding = Difficult and good	Medium to high	High	Medium	High	High	Medium	Resistant	Resistant
44	Black Cabbage bark Lonchocarpus castilloi	High	Inter-locked	Medium	Very high	Sawing = Moderate and good Planing = Difficult and good Turning = Easy and excellent Sanding = Easy and good	Very high	Very high	High	High to very high	High	Medium	Resistant	Extremely resistant
45	Palo gusano Lonchocarpus hondurensis	High	Straight to irregular to inter-locked	Medium to coarse	High	Sawing = Easy Planing = Easy and good Turning = Easy and excellent Sanding = Easy	High	High	High	High	High	Medium	Resistant	Resistant
47	Tepehuaje Lysiloma acapulcensis	High	Straight to inter-locked	Medium to coarse	Medium	Sawing = Moderate and fair Planing = Easy and fair Turning = Easy and fair Sanding = Easy and fair	Medium	Medium	Medium	Medium	Medium	Medium to small	Resistant	Extremely resistant

Timber Number	Species Common name Scientific name	Impact resistance	Grain	Texture	Basic density	Machinability and surface characteristics	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Transverse hardness	Dimensional movement	Resistance to termites dry-wood and/or Lyctus	Amenability to preservative treatment
77	Mesquite Prosopis juliflora	Very high	Straight to irregular	Coarse	High	Sawing = Moderate and good Planing = Moderate and fair Sanding = Easy and good Turning = Easy and fair	High	High	Medium to high	High	High	Medium to small	Resistant	
78	Anapola Pseudobombax ellipticum	Very high	Straight to irregular	Fine to medium	Medium	Sawing = Easy and fair Planing = Easy and excellent Turning = Easy and good Sanding = Easy and good	Very low	Low	Low	Very low	Very low	Small to medium		Moderately resistant
81	Oak Quercus acatenangensis	High	Straight	Coarse	High	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Medium	Medium	Medium	High	Medium	Small		
83	Oak Quercus crassifolia	Very high	Straight	Coarse	High	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Medium	Medium	Medium	High	High	Small		
84	Encino blanco Quercus germana	High	Straight to wavy	Coarse	High	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Medium	Medium	Low to medium	Medium	Medium	Medium to large		

Timber Number	Species Common name Scientific name	Impact resistance	Grain	Texture	Basic density	Machinability and surface characteristics	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Transverse hardness	Dimensional movement	Resistance to termites dry-wood and/or Lyctus	Amenability to preservative treatment
85	Encino roble Quercus rugosa	High	Straight	Coarse	High	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Medium	Medium	Medium	Medium	Medium	Medium to large		
86	Oak Quercus skinneri	Very high	Straight	Coarse	Very high	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Very high	High	High	Very high	Very high	Large		
90	Chacahuanté Sickinga salvadorensis	High	Straight to irregular	Fine	High	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Medium	High	High	High	High	Large		Permeable
94	Corazón azul Swartzia cubensis	High	Straight to irregular	Fine	Very high	Sawing = Moderate and good Planing = Moderate and excellent Turning = Moderate and excellent Sanding = Moderate and good	Very high	Very high	Very high	Very high	Very high	Medium	Resistant	
95	Billy Webb Sweetia panamensis	Very high	Wavy to roe	Fine	Very high	Sawing = Easy and good Planing = Easy and good Turning = Easy and excellent Sanding = Easy and good	Very high	Very high	Very high	Very high	Extremely high	Medium	Resistant	

Timber Number	Species Common name Scientific name	Impact resistance	Grain	Texture	Basic density	Machinability and surface characteristics	Modulus of elasticity	Modulus of rupture	Maximum crushing strength	Lateral hardness	Transverse hardness	Dimensional movement	Resistance to termites dry-wood and/or Lyctus	Amenability to preservative treatment
102	Nargusta Terminalia amazonia	High	Inter-locked to straight to irregular	Medium	High	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	High	High	Medium	High	Medium	Medium to small	Resistant	Extremely resistant
105	Fiddlewood Vitex gaumeri	High	Inter-locked to irregular	Fine	Medium	Sawing = Easy and excellent Planing = Easy and good Turning = Easy and excellent Sanding = Easy and good	High	High	High	High	High	Medium	Susceptible	Permeable to resistant

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to resist well impact loads, rough handling and indentation, together with a suitable weight to strength ratio so as to make the product as light as possible.
- Be able to be machined easily, especially in order to obtain rounded cross sections, with good smooth surfaces.
- Be able to resist impact blows on cross sections with minimum splintering.

With these requirements the timbers should be within the property limits shown below:-

PROPERTY LIMITS

- Density range (OD WT/GR Vol.) = 0.53-0.70 g/cm³.
- MOE range = 95000-165000 kg/cm², or 9310-16180 N/mm², Air-dry.
- MOR range = 850-1450 kg/cm², or 83-142 N/mm², Air-dry.
- Crushing strength = 425-775 kg/cm², or 42-76 N/mm², Air-dry.
- Lateral hardness = 375-900 kg, or 3680-8820 N, Air-dry.
- Transverse hardness = 470-1150 kg, or 4610-11280 N, Air-dry.
- Toughness = Greater than 1.96 cm-kg/cm³, or 0.200 mm-N/mm³, Air-dry.
- Grain = Straight.
- Dimensional movement = Medium to small.
- Texture = Medium coarse to fine.
- General machinability = Easy and good. That is easy to saw, turn and sand with good to excellent surfaces.
- Heartwood resistant to dry wood termites and Lyctus if not - sapwood and heartwood from resistant to permeable to preservative treatment.

TABLE 16. TOOL HANDLES, NON-IMPACT RESISTANT: Broom handles, brush heads, brush handles.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Average EMC % for interiors, Appendix 1.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Basic density	Grain	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
4	Aile Alnus acuminata	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Boring = Easy and good Sanding = Easy and excellent	Medium	Straight	Fine to medium	Small	Low	Low	
5	Wild mamee Alseis yucatanensis	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Boring = Easy and good Sanding = Easy and good	High	Straight	Very fine	Medium	High	High	
8	Angelin Andira inermis	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Boring = Easy and good Sanding = Easy and excellent	High	Straight to inter-locked	Coarse	Small	High	High	Toxic dust. Sapwood susceptible to Lyctus attack.

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Basic density	Grain	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
18	Degame Calycophyllum candidissmim	Sawing = Difficult and fair Planing = Moderate and fair Turning = Easy and good Boring = Moderate and good Sanding = Moderate and good	Very high	Straight to irregular	Fine	Medium	Medium to high	Medium to high	
33	Genipa Genipa americana	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and good Boring = Easy and good Sanding = Easy and good	High	Straight to inter-locked	Fine	Medium	Medium	Medium	
34	Cacahuananche Gliricidia sepium	Sawing = Moderate and good Planing = Difficult and moderate Turning = Easy and good Boring = Easy and good Sanding = Easy and good	High	Straight to inter-locked	Coarse	Medium	High	High	
35	Cramantee Guarea glabra	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and good Boring = Easy and fair Sanding = Easy and good	Medium	Straight to inter-locked	Medium	Medium	Low to medium	Low to medium	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Basic density	Grain	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
37	Urucurana Hieronyma alchorneides	Sawing = Difficult and good Planing = Difficult and poor Turning = Easy and good Boring = Easy and excellent Sanding = Easy and excellent	High	Irregular roey to inter-locked	Coarse	Medium to large	High	High	The poor planing characteristics are due mainly to the roey grain.
55	Pimientillo Misanteca peckii	Sawing = Easy and fair Planing = Easy and good Turning = Easy and excellent Boring = Easy and good Sanding = Easy and good	High	Straight	Medium	Small	Medium	Medium	
59	Provision tree Pachira aquatica	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and good Boring = Easy and good Sanding = Easy and good	Medium	Straight	Medium	Large	Very low	Very low	
62	Pine Pinus spp.	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Boring = Easy and good Sanding = Easy and good	Medium	Straight	Medium to fine	Medium to small	Low to medium	Low to medium	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Basic density	Grain	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
70	Barba jolote Pithecellobium arboreum	Sawing = Easy and fair Planing = Easy and fair Turning = Easy and excellent Boring = Easy and fair Sanding = Easy and fair	High	Inter-locked	Medium to coarse	Medium	Medium	Medium	
74	Granadillo Platymiscium yucatanum	Sawing = Easy and good Planing = Easy and good Turning = Easy and excellent Boring = Easy and good Sanding = Easy and excellent	Medium	Straight to inter-locked	Medium	Medium	Medium	High	
89	Chechén blanco Sebastiana longiscuspis	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Boring = Easy and good Sanding = Easy	High	Straight	Medium	Medium	Medium	Medium	
93	Bellota Sterculia apetala	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Boring = Easy and good Sanding = Easy and good	Low	Straight	Medium	Medium to small	Low	Low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Basic density	Grain	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
98	Apamate *Tabebuia rosea*	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Boring = Easy and excellent Sanding = Easy and excellent	Medium	Straight to inter-locked	Medium	Small	Low	Medium	
101	Southern wild mahogany *Tapirira guianensis*	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Boring = Easy and good Sanding = Easy and good	Medium	Straight	Fine	Medium	Low	Low	
104	Banak *Virola koschnyi*	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Boring = Easy and good Sanding = Easy and good	Medium	Straight	Medium to coarse	Large	Low	Low	
109	Trementino volador *Zuelania guidonia*	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Boring = Easy and good Sanding = Easy and good	High	Straight	Fine	Medium	High	High	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to be machined to obtain smooth rounded surfaces.
- Of relatively medium to low weight.
- Able to be stained, varnished or painted easily.
- Able to resist wetting without unduly large changes in dimensions and appearance of checks.

With these requirements the timbers should be within the property limits shown below:-

PROPERTY LIMITS

- Density range (OD WT/GT Vol.) = 0.38-0.65 g/cm^3.
- Lateral hardness range = 200-800 kg, or 1970-7850 N, Air-dry.
- Transverse hardness range = 250-1000 kg, or 2450-9800 N, Air-dry.
- Grain = Straight.
- Dimensional movement = Medium to small.
- Texture = Medium/coarse to fine.
- General machinability = Easy and good to excellent. That is easy to saw, plane, turn, bore, mould and sand with good to excellent surfaces, especially turn.
- Paintability = Should be able to take and hold well stains, paints and varnishes.

TABLE 17. NOVELTY KITCHEN ITEMS: Bowls, cruet sets, dishes, carving boards, spoons, and others.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Average EMC % for interiors. Appendix 1.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Texture	Basic density	Grain	Colour of heartwood	Figure pattern and occurrence	Dimensional movement	Lateral hardness	Transverse hardness	Observations
4	Aile Alnus acuminata	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and excellent	Fine to medium	Medium	Straight	Pale pink	Soft to pronounced due to rays and growth rings	Small	Low	Low	
8	Angelin Andira inermis	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy amd excellent	Coarse	High	Straight to inter-locked	Yellowish brown to reddish brown	Bands of light coloured parenchyma give distinct figure	Small	High	High	Toxic dust. Sapwood susceptible to Lyctus attack.
11	Popiste Blepharidium mexicanum	Sawing = Easy and fair Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Fine	High	Straight	Reddish yellow with a pale brown hue	Indistinct	Large	Low	Low	
15	Red gombolimbo Bursera simaruba	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and very poor Sanding = Easy and good	Fine to medium	Low	Straight to irregular	White yellowish or light brown	Ribbon weak	Small	Low	Low	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Texture	Basic density	Grain	Colour of heartwood	Figure pattern and occurrence	Dimensional movement	Lateral hardness	Transverse hardness	Observations
18	Degame Calycophyllum candidissimum	Sawing = Difficult and fair Planing = Moderate and fair Turning = Easy and good Sanding = Moderate and good	Fine	Very high	Straight to irregular	Light brown to oatmeal in colour	Indistinct	Medium	Medium to high	Medium to high	
33	Genipa Genipa americana	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and good Sanding = Easy and good	Fine	High	Straight to inter-locked	Pale brown pinkish to brown yellowish	Quarter sawn stripe weak	Medium	Medium	Medium	
34	Cacahuananche Gliricidia sepium	Sawing = Moderate and good Planing = Difficult and moderate Turning = Easy and good Boring = Easy and good Sanding = Easy and good	Coarse	High	Straight to inter-locked	Pale olive brown	Fine pencil stripe from parenchyma	Medium	High	High	Colour deepens on exposure.
35	Cramantee Guarea glabra	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and good Sanding = Easy and good	Medium	Medium	Straight to inter-locked	Light reddish brown darkening with time	Indistinct	Medium	Low to medium	Low to medium	
37	Urucurana Hieronyma alchorneoides	Sawing = Difficult and good Planing = Difficult and poor Turning = Easy and good Sanding = Easy and excellent	Coarse	High	Irregular roey to inter-locked	Light reddish brown to chocolate brown to dark red	Flat sawn parabolic markings to variation in colour	Medium to large	High	High	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Texture	Basic density	Grain	Colour of heartwood	Figure pattern and occurrence	Dimensional movement	Lateral hardness	Transverse hardness	Observations
55	Pimientillo Misanteca peckii	Sawing = Easy and fair Planing = Easy and good Turning = Easy and excellent Sanding = Easy and good	Medium	High	Straight			Small	Medium	Medium	
59	Provision tree Pachira aquatica	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and good Sanding = Easy and good	Medium	Medium	Straight	Pale pink or pale orange	Slight due to vessel lines	Large	Very low	Very low	
62	Pine Pinus spp.	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Medium to fine	Medium	Straight	White, pale yellowish brown to reddish brown	Flatsawn parabolic figure due to growth rings	Low to medium	Low to medium	Low to medium	
70	Barba jolote Pithecellobium arboreum	Sawing = Easy and fair Planing = Easy and fair Turning = Easy and excellent Sanding = Easy and fair	Medium to coarse	High	Inter-locked	Pale reddish brown	Indistinct	Medium	Medium	Medium	
74	Grenadillo Platymiscium yucatanum	Sawing = Easy and good Planing = Easy and good Turning = Easy and excellent Sanding = Easy and excellent	Medium	Medium	Straight to inter-locked	Pale brown reddish	Pronounced figure flatsawn due to parenchyma bands	Medium	Medium	High	
89	Chechén blanco Sebastiana longiscuspis	Sawing = Easy and good Planing = Easy and good Turning = Easy and excellent Sanding = Easy	Medium	High	Straight	Pinkish white with dark brown specks	Indistinct	Small	Medium	Medium	

Timber Number	Species Common name Scientific name	Machinability and surface characteristics	Texture	Basic density	Grain	Colour of heartwood	Figure pattern and occurrence	Dimensional movement	Lateral hardness	Transverse hardness	Observations
91	Negrito Simarouba glauca	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Medium	Medium	Straight	Whitish or straw coloured with occasional oily streaks	Indistinct	Medium	Low	Low	
98	Apamate Tabebuia rosea	Sawing = Easy and good Planing = Easy and good Turning = Easy and excellent Sanding = Easy and excellent	Medium	Medium	Straight to inter-locked	Light brown with a greyish or more commonly golden hue	Quarter sawn stripe and flatsawn feather figure	Small	Low	Medium	
101	Southern wild mahogany Tapirira guianensis	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Fine	Medium	Straight	Brownish pink	Flatsawn parabolic figure due to growth rings	Medium	Low	Low	
104	Banak Virola koschnyi	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Medium to coarse	Medium	Straight	On exposure pinkish golden brown or deep reddish brown	Indistinct	Large	Low	Low	
105	Fiddlewood Vitex gaumeri	Sawing = Easy and excellent Planing = Easy and good Turning = Easy and excellent Sanding = Easy and good	Fine	Medium	Inter-locked to irregular	Pale yellow with greyish brown hues	Quartersawn fiddleback weak	Medium	High	Medium	
109	Trementino volador Zuelania guidonia	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Fine	High	Straight	Pale yellow with a reddish hue	Indistinct	Medium	High	High	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to be machined to obtain very smooth rounded surfaces.
- Able to resist wetting without unduly large changes in dimension and checking, and without application of finishes.
- Able to obtain striking or interesting figures on the surfaces of the pieces due to attractive grain patterns in the wood.
- Of relatively medium to low weight.
- Must not contain resins or extractives that might impart toxic or bad odours and tastes.

With these requirements the timbers should be within the property limits shown below:-

PROPERTY LIMITS

- Density range (OD WT/GR Vol.) = 0.38-0.65 g/cm^3.
- Lateral hardness range = 200-800 kg, or 1970-7850 N, Air-dry.
- Transverse hardness range = 250-1000 kg, or 2450-9800 N, Air-dry.
- Grain = The whole range.
- Dimensional movement = Medium to small.
- Texture = Medium to fine.
- General machinability = Easy and good to excellent. That is easy to saw, plane, turn, mould and sand with good to excellent surfaces, especially turn.
- Paintability = Should be able to obtain a durable attractive surface without paints or varnishes, with only oils and waxes or nothing.
- Figure = Of attractive pattern or colour.
- Low resin content or soluble extractives in water and oil, that would be toxic or impart bad odour or tastes to foodstuffs.

TABLE 18. NOVELTY AND CRAFT ITEMS: Turnings, desk sets, carvings, rings, stools, toys, bowls, knife handles, and others.

The following recommendations are made regarding the use of the timbers included in this table:

- Recommended moisture content range = Average EMC % for interiors, Appendix 1.

The table is arranged so that what we considered the most important properties for the end use are in the left hand column next to the name of the timber and the least important property is next to the observations column.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Grain	Basic density	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
6	Luin Ampelocera hottlei	Pale yellow with dark lines on edges of "growth" rings	Indistinct	Sawing = Easy Planing = Easy and good Turning = Easy and excellent Sanding = Easy and good	Straight to inter-locked	High	Medium	Medium	High	Medium	
8	Angelin Andira inermis	Yellowish brown to reddish brown	Bands of light coloured parenchyma give distinct figure	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and excellent	Straight to irregular	High	Coarse	Small	High	High	Toxic dust. Sapwood susceptible to Lyctus attack.
9	Mylady Aspidosperma megalocarpon	Light pinkish brown or pale yellowish brown	Indistinct	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Straight to inter-locked	High	Medium to fine	Medium	High	High	
11	Popiste Blepharidium mexicanum	Reddish yellow with a pale brown hue	Indistinct	Sawing = Easy and fair Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Straight	High	Fine	Large	Low	Low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Grain	Basic density	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
16	Partridge wood Caesalpinia granadillo	Dark red to chocolate brown or nearly black	Partridge figure distinct	Sawing = Difficult and good Planing = Difficult and good Turning = Easy and good Sanding = Difficult and good	Straight to interlocked to irregular	Extremely high	Medium	Medium to large	Very high	Very high	Pencil striping of parenchyma.
18	Degame Calycophyllum candidissimum	Light brown to oatmeal colour	Indistinct	Sawing = Difficult and fair Planing = Moderate and fair Turning = Easy and good Sanding = Moderate and good	Straight to irregular	Very high	Fine	Medium	Medium to high	Medium to high	
21	Cedar Cedrela odorata	Brown reddish	Flat sawn growth ring roe distinct	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Straight to roe	Medium	Fine to medium	Small	Low	Low	
23	Ziricote Cordia dodecandra	Dark brown	Quarter-sawn stripe flatsawn difference in colour	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and good Sanding = Easy and excellent	Straight to irregular	Very high	Fine	Medium to small	High	High	
25	Granadillo Dalbergia retusa	On exposure deep rich orange red with black striping	Very fine and distinct	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Straight to irregular	Very high	Fine to medium	Small	High	High	Fine dust may cause dermatitis.

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Grain	Basic density	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
26	Rosewood Dalbergia stevensonii	Pinkish brown to purple with alter-nating dark and light zones	Stripe very fine and distinct	Sawing = Moderate and good Planing = Moderate and good Turning = Easy and good Sanding = Easy and good	Straight or roe figure	Very high	Medium to coarse	Small	High	High	Dulls cutting edges. Tends to ride over cutters.
30	Bustic Dipholis salicifolia	Dark reddish brown	Flatsawn soft parabolic figure	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Straight	Very high	Fine to medium	Medium	Very high	Very high	
31	Guaité Dipholis stevensonii	Pale reddish brown	Indistinct	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Straight	Very high	Medium	Medium	Very high	Very high	
39	Courbaril Hymenaea courbaril	Russet to reddish brown with dark streaks	Pronounced due to growth ring and dark streaks	Sawing = Difficult and good Planing = Difficult and fair Turning = Difficult and good Sanding = Difficult and good	Interlocked and straight to irregular	Very high	Fine to medium	Medium	High	High	
41	Pencil Cedar Libocedrus decurrens	Brown reddish	Slight due to difference between early and latewood	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and excellent	Straight	Low	Medium to fine	Small	Low	Very low	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Grain	Basic density	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
44	Black cabbage bark *Lonchocarpus castilloi*	Dark reddish brown	Flatsawn distinct figure due to parabolic margins	Sawing = Moderate and good Planing = Difficult and good Turning = Easy and excellent Sanding = Easy and good	Interlocked	Very high	Medium	Medium	High to very high	High	
45	Palo gusano *Lonchocarpus hondurensis*	Reddish brown with dark reddish brown specks	Pronounced due to vessel lines and parenchyma	Sawing = Easy Planing = Easy and good Turning = Easy and excellent Sanding = Easy	Straight to irregular to inter-locked	High	Medium to coarse	Medium	High	High	
47	Tepehuaje *Lysiloma acapulcensis*	Dark brown with chocolate or reddish grey hues	Pronounced due to vessel lines	Sawing = Moderate and fair Planing = Easy and fair Turning = Easy and fair Sanding = Easy and fair	Straight to inter-locked	Medium	Medium to coarse	Medium to small	Medium	Medium	
48	Tzalam *Lysiloma bahamensis*	Dark brownish red	Pronounced figure due to parenchyma bands	Sawing = Easy and good Planing = Easy and fair Turning = Easy and fair Sanding = Easy	Straight to irregular	High	Medium	Medium	Medium	Medium	
53	Chechem *Metopium brownei*	Bands of dark reddish brown, black, green and pale brown golden hue	Pronounced figure flat and quarter-sawn	Sawing = Moderate and good Planing = Easy and good Turning = Easy and good Sanding = Easy and excellent	Straight to inter-locked	Very high	Fine		Very high	Very high	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Grain	Basic density	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
54	Chicharra Miranda celtis monoica	Reddish brown	Pronounced due to bands of parenchyma	Sawing = Easy and good Planing = Easy and good Turning = Easy and good Sanding = Easy and good	Interlocked	High	Fine	Small	High	Medium to high	
57	Balsamo Myroxylon balsamum	On exposure deep red or somewhat purplish striped	Quarter-sawn stripe very fine and distinct	Sawing = Moderate and good Planing = Moderate and good Turning = Easy and good Sanding = Moderate and good	Straight to interlocked to roe	Very high	Fine to medium	Small	Very high	Very high	Dulls cutting edges.
60	Amaranth Peltogyne pubescens	Deep purple turning to dark brown	Indistinct	Sawing = Moderate and good Planing = Moderate and good Turning = Easy and good Sanding = Easy and good	Straight to wavy to interlocked	Very high	Fine	Medium to large	Very high	Very high	
70	Barba jolote Pithecellobium arboreum	Pale reddish brown	Indistinct	Sawing = Easy and fair Planing = Easy and fair Turning = Easy and excellent Sanding = Easy and fair	Interlocked	High	Medium to coarse	Medium	Medium	Medium	
72	Palo santo Platymiscium pinnatum	Bright red, purplish red or light reddish brown, with dark streaks	Stripe distinct	Sawing = Easy and good Planing = Easy and good Turning = Easy and excellent Sanding = Easy and excellent	Straight to roe to interlocked	Very high	Fine to medium	Small	Very High	Very high	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Grain	Basic density	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
74	Granadillo Platymiscium yucatanum	Pale brown reddish	Pronounced figure flatsawn due to parenchyma bands	Sawing = Easy and good Planing = Easy and good Turning = Easy and excellent Sanding = Easy and excellent	Straight to interlocked	Medium	Medium	Medium	Medium	High	
90	Chacahuanté Sickinga salvadorensis	Pink or red with darker coloured zones on exposure yellow brown	Quartersawn, "sunset" figure dulls on exposure	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Straight to irregular	High	Fine	Large	High	High	
94	Corazón azul Swartzia cubensis	Dark reddish brown with purplish tinge	Flatsawn distinct parabolic figure	Sawing = Moderate and good Planing = Moderate and excellent Turning = Moderate and excellent Sanding = Moderate and good	Straight to irregular	Very high	Fine	Medium	Very high	Very high	Dust irritating to workers.
95	Billy Webb Sweetia panamensis	Dark yellowish brown with dark streaks	Quartersawn distinct narrow ribbon	Sawing = Easy and good Planing = Easy and good Turning = Easy and excellent Sanding = Easy and good	Wavy to roe	Very high	Fine	Medium	Very high	Extremely high	
96	Mahogany Swietenia macrophylla	Brown reddish to yellowish	Flat-quartersawn stripe variety distinct	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and good Sanding = Easy and good	Straight to interlocked	Medium	Fine to medium	Small	Low	Low to medium	

Timber Number	Species Common name Scientific name	Colour of heartwood	Figure pattern and occurrence	Machinability and surface characteristics	Grain	Basic density	Texture	Dimensional movement	Lateral hardness	Transverse hardness	Observations
102	Nargusta Terminalia amazonia	Yellowish olive to golden brown. Reddish -brown stripes	Quarter-sawn stripe, wavy fiddleback variable	Sawing = Easy and good Planing = Easy and excellent Turning = Easy and excellent Sanding = Easy and good	Interlocked to straight to irregular	High	Medium	Medium to small	High	Medium	

The construction of the above table and the timbers included in it were based on the following:

USE REQUIREMENTS

- Able to be machined easily to obtain very smooth and rounded surfaces.
- Of attractive colour or grain pattern.
- Fine textured and of medium to high weight, able to resist scratches and indentations.
- Able to take and hold well transparent finishes, or to look attractive with no finish at all.
- Dimensionally stable with changes in moisture content.

With these requirements the timbers should be within the property limits shown below:-

PROPERTY LIMITS

- Density range (OD WT/GR Vol.) = Greater than 0.48 g/cm^3.
- Lateral hardness = Greater than 400 kg, or 3920 N, Air-dry.
- Transverse hardness = Greater than 500 kg, or 4900 N, Air-dry.
- Grain = The whole range.
- Dimensional movement = Medium to small.
- Texture = Medium to fine.
- General machinability = Easy and good to excellent. That is easy to saw, plane, turn, mould, and sand with good to excellent surfaces, especially when turned.
- Paintability = Should be able to take and hold well transparent hard finishes or oils and waxes.
- Figure = Of attractive pattern or colour.

3.3 Specifications of property classification and limits

The following definitions define the categories listed in the tables:

3.3.1 Basic Density. (Oven dry wt and green volume g/cm^3)

Very low	< 0.26
Low	0.27-0.38
Medium	0.39-0.56
High	0.57-0.70
Very high	0.71-0.89
Extremely high	> 0.90

3.3.2 Resistance to splitting by nails and screws. Number of pieces free from splitting expressed as a percentage.

Excellent	100-90%
Good	89-70%
Fair	69-50%
Poor	49-30%
Very poor	29-0%

3.3.3 Planing, turning, moulding, mortising, sanding sawing and boring quality. Number of pieces of 'excellent finish', expressed as a percentage.

Excellent	100-90%
Good	89-70%
Fair	69-50%
Poor	49-30%
Very poor	29-0%

3.3.4 Grain.

Straight
Wavy
Irregular
Interlocked
Curly
Roe

3.3.5 Texture.

Fine
Medium
Coarse

3.3.6 Movement. Sum of the percentage radial and tangential dimensional changes consequent upon a reduction in relative humidity from 90 to 60 percent.

	%
Small	< 3
Medium	3.0-4.5
Large	> 4.5

3.3.7 Natural durability, ground contact

3.3.7.1 Natural durability. Resistance to fungi and insect attack in ground contact. All sapwood is classified as perishable. It is expressed as the number of years in the ground.

	Conditions		
	Temperate		Tropical
Very durable	> 25	years	> 10
Durable	24-15		10-5
Moderately durable	14-10		5-2
Non-durable	9-5		2-1
Perishable	< 5		< 1

3.3.7.2 Natural durability. (Accelerated laboratory trials) Resistance to fungi under controlled laboratory conditions. It is expressed as the amount of loss in weight expressed in percentage. (Over the period of time during which a very susceptible wood shows 60% weight loss, AST19 613).

	%
Very durable	< 10
Durable	11-24
Moderately durable	25-44
Perishable	> 45

3.3.8 Resistance to dry wood termites. Based on the degree of damage done to the wood, as appreciated by visual inspection. (Exposure 110 days in contolled conditions (Williams, 1973).

0	Resistant	Without damage
1	Moderately resistant	Slight damage, the surface scratched
2	Susceptible	Medium damage, perforations shallow
3	Very susceptible	Great damage, presence of deep galleries

3.3.9 Amenability to preservative treatment.

Permeable:

These timbers can be completely penetrated under pressure without difficulty, and can usually be heavily impregnated by the hot and cold open tank process.

Moderately resistant:

These timbers are fairly easy to treat and it is usually possible to obtain a lateral penetration of the order of 6 to 18 mm in about 2 to 3 hours under pressure or the penetration of a large proportion of the vessels.

Resistant:

These timbers are difficult to impregnate under pressure and require a long period of treatment. It is often very difficult to penetrate them laterally more than about 3 to 6 mm.

Extremely resistant:

These timbers absorb only a small amount of preservative even under long pressure treatments. They cannot be penetrated to an appreciable depth laterally and only to a very small extent longitudinally.

3.3.10 Mechanical properties. At a 12% moisture content. (For tests carried out on small clear specimens).

STATIC BENDING

in kg/cm^2

Property	Very low	Low	Medium	High	Very high
MOR	< 400	401-900	901-1350	1351-1800	> 1800
MOE x 10^3	< 70	71-100	101-150	151-200	> 200

in N/mm^2

MOR	< 39	39-88	89-132	133-176	> 176
MOE	< 6860	6860-9800	9900-14700	14800-19600	> 19600

COMPRESSION PARALLEL TO THE GRAIN

in kg/cm^2

Property	Very low	Low	Medium	High	Very high
MCS	< 300	301-450	451-700	701-950	> 950

in N/mm^2

MCS	< 29	29-44	45-68	69-93	> 93

COMPRESSION PERPENDICULAR TO THE GRAIN

in kg/cm^2

Property	Very low	Low	Medium	High	Very high
SPL	< 35	35-75	76-120	121-175	> 175

in N/mm^2

SPL	< 3.5	3.5-7.5	7.6-11.8	11.8-17.2	> 17.2

Note: MOR = Modulus of Rupture
MOE = Modulus of Elasticity
MCS = Maximum compression strength
SPL = Strength perpendicular to grain.
N = Newtons
Kg-m = Kilogram - metre.

HARDNESS JANKA
in kg

Property	Very low	Low	Medium	High	Very high
Lateral	< 200	201-400	401-800	801-1200	> 1200
Transverse	< 250	251-500	501-1000	1001-1500	> 1500

in N

Lateral	< 1960	1961-3290	3921-7840	7841-11760	> 11760
Transverse	< 2450	2451-4900	4901-9800	9801-14700	> 14700

TOUGHNESS -IMPACT BENDING
2 x 2 x 28 cm specimen
in kg-m

Very low	Low	Medium	High	Very high
< 2.07	2.07-3.80	3.80-5.53	5.53-7.26	> 77.26

in Joules = Newton-metre

< 20.3	20.3-37.3	37.3-54.2	54.2-74.2	> 71.2

Note: The Janka hardness test is a standard test by which a 0.222 inch steel ball is pressed into the timber to half its diameter and the force required to do this is measured.

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Notes:

1. LACITEMA = Laboratorio de Ciencia y Technologia de la Madera, Mexico.

2. INIREB = Instituto Nacional de Investigaciones Sobre Recursos Bioticos, Mexico.

3. INIF = Instituto Nacional de Investigaciones Forestales, Mexico.

4. FORPRIDECOM = Forest Products Research and Industries Development Commission, Philippines.

5. TRADA = Timber Research and Development Association, U.K.

APPENDIX 1

AVERAGE EQUILIBRIUM MOISTURE CONTENT (EMC) OF TIMBER IN DIFFERENT CITIES IN MEXICO AND IN BELIZE.

EMCs are listed by "Exterior" EMC which a timber would reach after prolonged air drying and "Interior" EMC which would prevail inside a normal building.

City	Average EMC %	
	Exterior	Interior
Acapulco, Gro.	15.5	13.5
Aguascalientes, Ags	10.5	8.5
Campeche, Camp.	15.0	13.0
Ciudad Lerdo, Dgo.	8.0	8.0
Chihuahua, Chih.	6.0	6.0
Chilpancingo, Gro.	16.0	14.0
Colima, Col.	13.0	11.0
Comitán, Chis	16.0	14.0
Córdoba, Ver.	15.5	13.5
Cozumel, Q.R.	18.5	16.5
Culiacán, Sin.	13.0	11.0
Durango, Dgo.	9.5	7.5
Ensenada, B.C.	17.0	15.0
Guadalajara, Jal.	10.5	8.5
Guanajuato, Gto.	9.5	7.5
Guaymas, Son.	10.5	8.5
Hermosillo, Son.	8.0	8.0
Huejúcar, Jal.	11.0	9.0
Lagos de Moreno, Jal.	11.5	9.5
La Paz, B.C.	11.5	9.5
León Gto.	11.0	9.0
Manzanillo, Col.	15.0	13.0
Mazatlán, Sin.	15.5	13.5
Mérida, Yuc.	14.0	12.0
Monclova, Coah.	10.5	8.5
Monterrey, N.L.	12.5	10.5
Morelia, Mich.	12.0	10.0
Oaxaca, Oax.	10.5	8.5
Orizaba, Ver.	14.5	12.5
Pachuca, Hgo.	15.5	13.5
Piedras Negras, Coah.	12.5	11.5
Progreso, Yuc.	15.5	13.5
Puebla, Pue.	10.5	8.5
Querétaro, Qro.	10.0	8.0
Rio Verde, S.L.P.	14.0	12.0
Salina Cruz, Oax	14.0	12.0
Saltillo Coah.	12.0	10.0
San Cristobal las C., Chis	15.5	13.5
San Luis Potosí, S.L.P.	9.5	7.5
Soto la Marina, Tamps.	15.5	13.5
Tacubaya, D.F.	11.5	9.5
Tampico, Tamps.	17.5	15.5
Tapachula, Chis.	14.5	12.5
Tepic, Nay.	17.5	15.5

Texcoco, Méx.	12.5	10.5
Tlaxcala, Tlax.	11.0	9.0
Toluca, Méx.	12.0	10.0
Torreón, Coah.	9.0	9.0
Tulancingo, Hgo.	15.5	13.5
Tuxtla Gutiérrez, Chis.	14.5	12.5
Veracruz, Ver.	16.5	14.5
Xalapa, Ver.	16.0	14.0
Zacatecas, Zac.	10.5	8.5
Belize approximate average for the whole country	17.0	12.0

For "wet areas" which all the year round have relatively high humidities, or have well defined dry and wet seasons
AV. EMC % INTERIOR = AV. EMC % EXTERIOR - 2.0%

For "dry areas" which all the year round have relatively low humidities, places where the EMC % values in April and September are equal to or below 10%
AV. EMC % INTERIOR = AV. EMC % EXTERIOR

APPENDIX 2

DIMENSIONS OF TIMBER FOR STRUCTURAL PURPOSES, RÉSUMÉ OF OFFICIAL MEXICAN STANDARD NOM-C-224-1983.

This standard applies to lumber that is dry (with a uniform moisture content, and equal to 18 percent ± 2 percent tolerance) and surfaced on the four sides with a planer.

The cross sectional dimensions are given in table 1, as well as the lengths.

Table 1. Thickness, width, and length dimensions

Thickness mm	Width mm	Length mm
19	87	2440
24	140	3050
38	190	3660
64	240	4270
87	290	4870
140		5480
		6100

The permitted tolerances are given below:

For dimensions between 18 to 38 mm a ± tolerance of 0.8 mm.
For dimensions between 39 to 290 mm a ± tolerance of 1.0 mm.
For dimensions between 291 to 6100 mm a ± tolerance of 6.0 mm.

APPENDIX 3

STRUCTURAL GRADES FOR PINE TIMBER

RESUMÉ OF OFFICIAL MEXICAN STANDARD NOM-C-239-1985

These grading rules can be applied to pine lumber of all species of Mexico, to be used for structural purposes, except Pinus ayacahuite. They are to be used with dry lumber (moisture content $\leq$ 18 percent) and surfaced on the four sides. The dimensions of the lumber to be graded by these rules are the ones specified in standard NOM-C-224-1983, as shown in Appendix 2.

In this appendix three types of grading rules are shown: "General", "Special", and "Industrial", all of them based on the general principle of the projection of the knot area on the cross section of the piece. The differences between the three rules are based on dimensions allowed for each defect and its placement within the piece. The rules group the pine lumber in three structural qualities: class "A" with high strength, class "B" with medium strength and class "G" with low strength not suitable for structural purposes.

The "General" rules can be applied to pine lumber of any dimension specified in Appendix 2. The criteria for these rules are simple and conservative, reasons why the strength values assigned to the classes generated by this rule are relatively low. Because of its easiness of application they are recommended for those users of pine structural lumber that do not require material with high strength values, and wish to avoid quite strict quality control measures.

The "Special" rules are more strict with respect to dimensions of the knots on the edges and without being more complicated than the "General" rules, the quality of the material is stronger for a given grade because of the tighter specifications.

In order to apply the "Special" rules the pine lumber is grouped into the following dimensions:

"Timbers": 87 x 87 mm, and 87 x 190 mm.

"Dimensions": 38 mm in thickness and up to 140 mm in width.

"Boards": 38 mm in thickness and widths larger than 140 mm.

The "Industrial" rules can only be applied to lumber 38 mm in thickness, and width up to 240 mm. The main characteristic of these rules is to classify pine lumber so as to assign to it higher strength values than those assigned with the "General" or "Special" rules. This is done basically by reducing the maximum allowable dimensions of the defects, especially the maximum size of the knots on the edges or in the central portion of the pieces.

Which rules to use depends mainly on the user and the end-use to which the lumber is to be applied. For example, if there is a lot of lumber of rather low quality, it could be classified using the "General" rules. On the other hand, if the user requires high strength material to fabricate let us say trusses, then it would be more appropriate to use the "Industrial" rules. By selecting the appropriate rule optimum utilisation of the timber is obtained.

DEFINITIONS In order to apply correctly any of the three rules, it is necessary to define some of the terms used in them.

a) Cross section and total area (A_t).

Is the resultant area of a real or imaginary cut perpendicular to the longitudinal axis of the piece. The total area is the surface of the cross section (see figure 1, page 135).

b) Zones adjacent to the edges.

Are the zones adjacent to the timber edge of least cross section with a size one eighth of the largest of the cross section dimensions. In square cross sections, any two opposite edges can be chosen. (see figure 1b, page 135).

c) Knot areas.

For the classification purposes, two concepts are utilized:

One is the "knot area" (A_n), and the other is the "knot area in the zone adjacent to the edge" (A_{nc}). The knot area, A_n, is the total area of the knot or knots in a given length of 15 cm, projected on the cross section of the piece of timber. The knot area in the zone adjacent to the edge, A_{nc}, is the knot area in 15 cm. of the timber projected on the cross section of the timber (see figure 1c page 135).

d) Slope of grain.

Is the deviation of the direction of the grain from the longitudinal axis of the piece of lumber. It is measured as the relation between the deviation of one unit of length, AB in figure 2, and the longitudinal distance where the separation occurs, AC in figure 2, (page 136).

e) Wane.

Is the lack of wood on the edge(s) of a piece of lumber. It is measured as shown in figure 3, (page 137).

f) Insect attack and larva holes.

The first type of defect refers to the perforations caused by insects, which generally are not over 1 mm in diameter, and sometimes they have blue stain around the perforation. The larva holes are larger cavities, and on occasions they are present as galleries plugged with sawdust (see figure 4, page 138).

g) Resin pockets.

Are deposits of resin between growth rings, and they are taken as knots for the purpose of grading. The effects of the resin pockets on the strength of the piece of lumber is not significant when they are small. However when the resin pocket occupies the entire thickness of the piece, they are taken as splits for the purpose of gradings (see figure 5, page 139).

h) Local grain deviation.

Is the grain deviation caused by a knot that was in an adjacent piece of lumber sawn to the piece being graded (see figure 6, page 140).

i) Split.

Is the separation between fibres of the piece of lumber caused during drying. It affects the thickness of a piece (see figure 7).

j) Compression wood.

Is the reaction wood that develops on the lower portion or boles of inclined trees. Generally it is harder, darker and more brash than "normal" wood.

k) Stain.

Are changes in the colour of the wood, that do not affect the structure of the wood, caused by staining fungi.

l) Decay.

Gradual decomposition of the structure of the wood caused by wood destroying fungi.

m) Warp.

Is any deviation of the piece of lumber from a true or plane surface, whether in the longitudinal, transverse or both direction. It is caused during the drying of the pieces. Four types are recognised (see figure 8):

m.1 Cup - is a deviation in the face of a piece from straight line drawn edge to edge of the piece.

m.2 Bow - is a deviation flatwise from a straight line drawn end to end of a piece.

m.3 Crook (spring) - is a deviation edgewise from a straight line drawn from end to end of a piece.

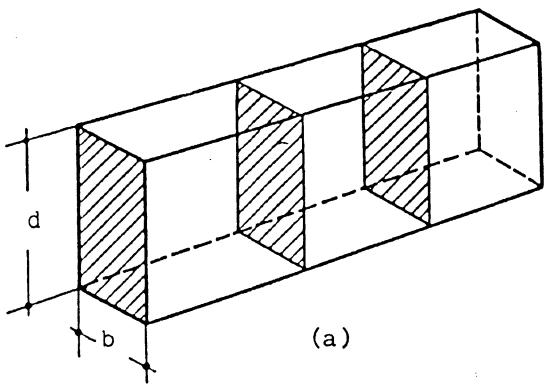
m.4 Twist - is a deviation flatwise, or a combination of flatwise and edgewise, in the form of a curl or spiral.

n) Very light wood.

Is wood that has a 'density' not greater than 0.40 g/cm^3 at 12% moisture content.

o) Shake.

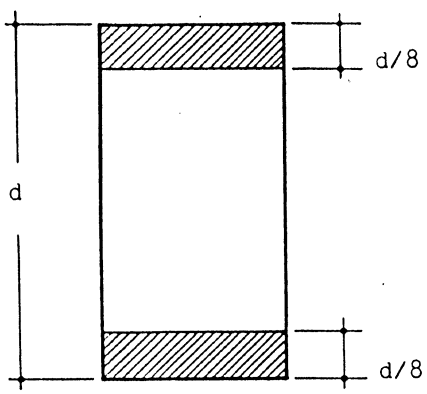
A lengthwise separation of the wood which usually occurs between or through the rings of annual growth.



The shadowed areas are examples of cross sections of a piece.

Total area of a cross section (A_t):

$A_t = b \times d$



Zones adjacent to the edges

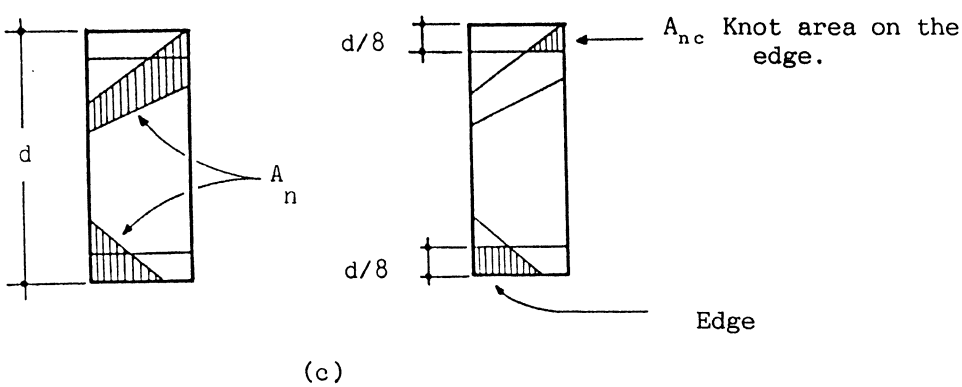
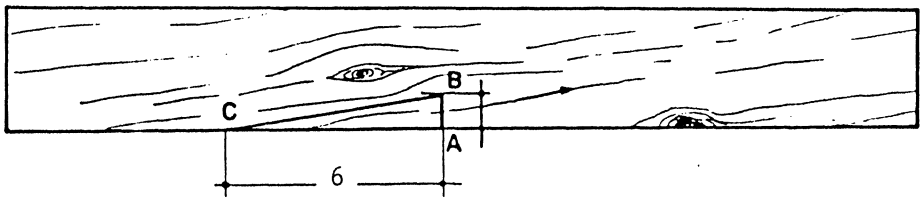


Figure 1. Definition of cross section, total area (A_t) and the adjacent zones to the edges, knot area (A_n), knot area on the edge (A_{nc}).



AC = 6, AB 1: Slope of grain 1:6

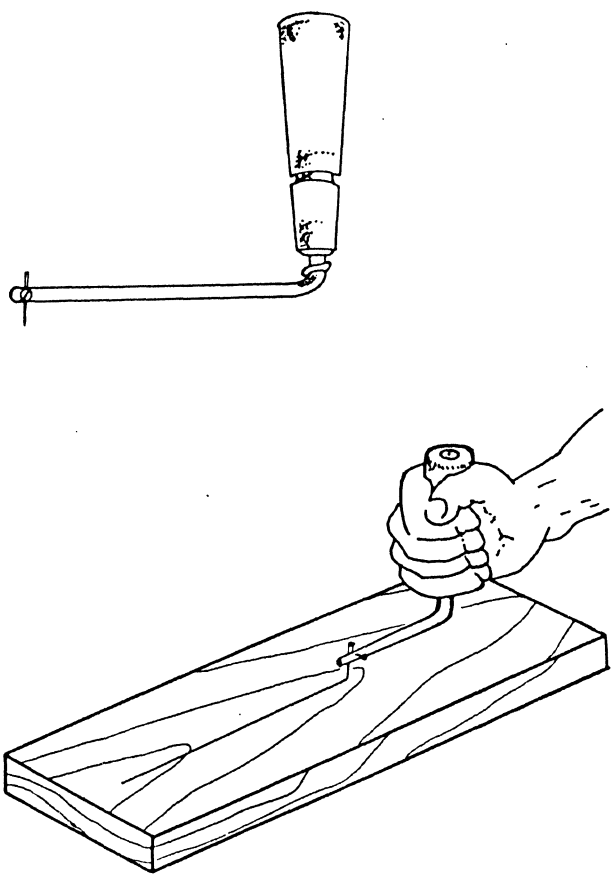
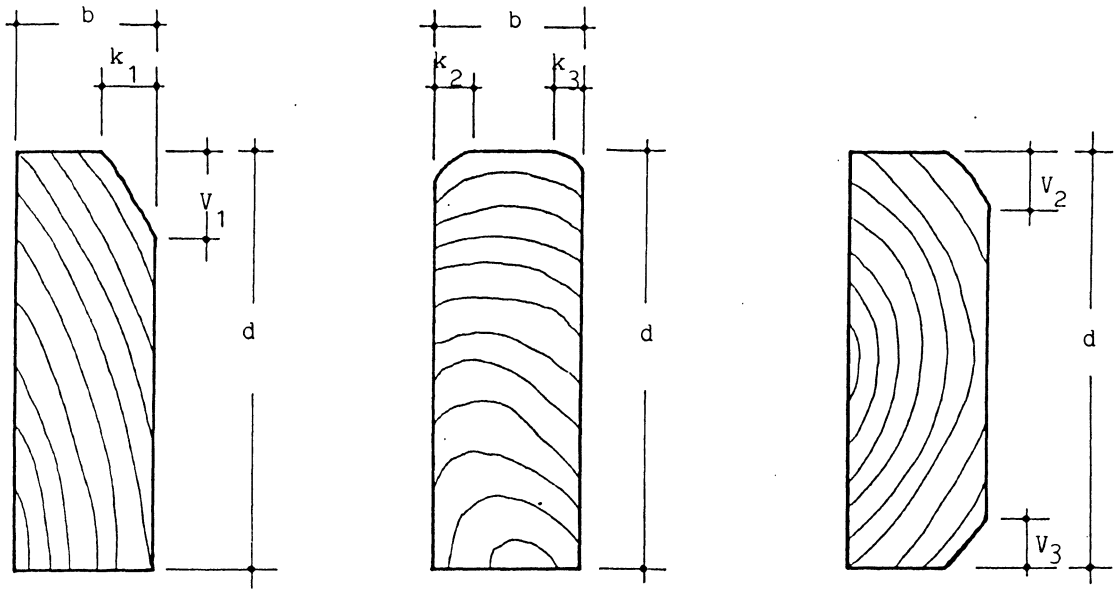


Figure 2. Slope of grain and its measurement.



$\frac{V_1}{d}$ or $\frac{K_1}{b}$

(whichever is greater)

$\frac{K_2 + K_3}{b}$

$\frac{V_2 + V_3}{d}$

Figure 3. Ways to measure wane.

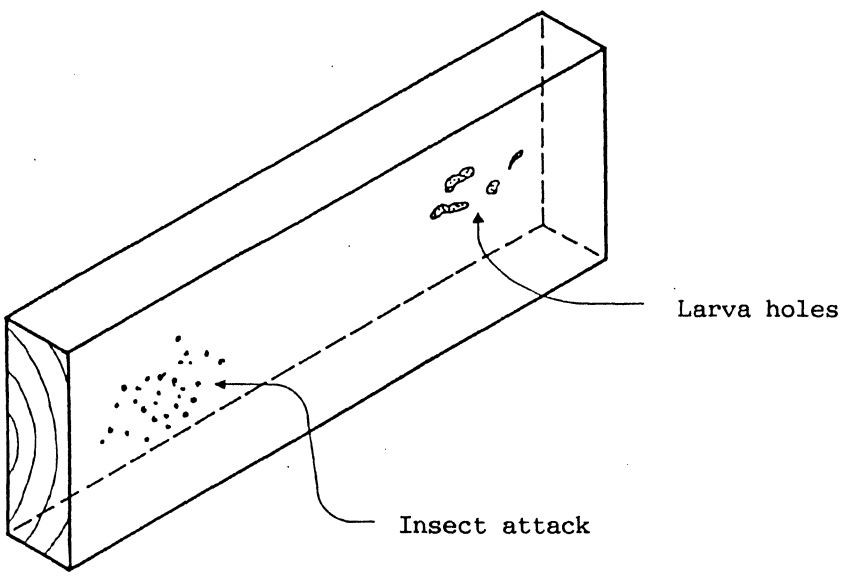


Figure 4. Examples of insect attack and larva holes.

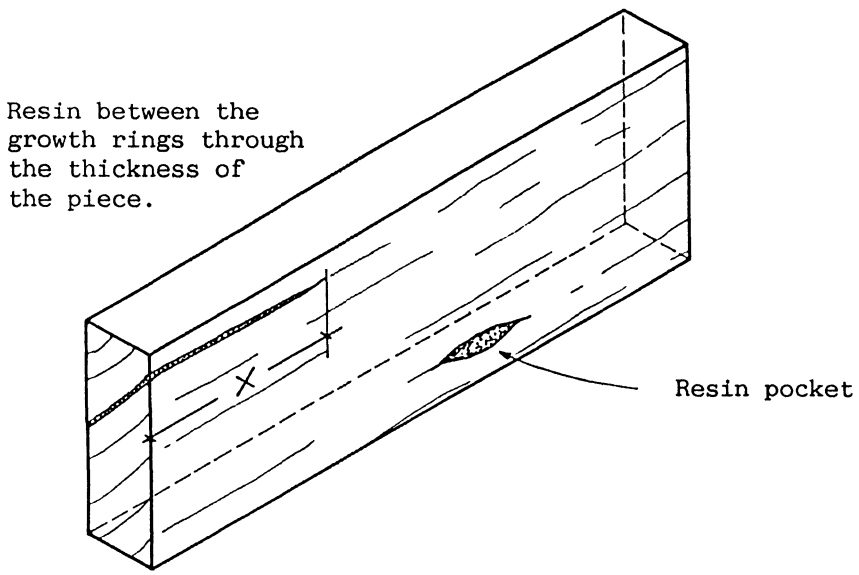


Figure 5. Types of resin pockets in pine lumber.

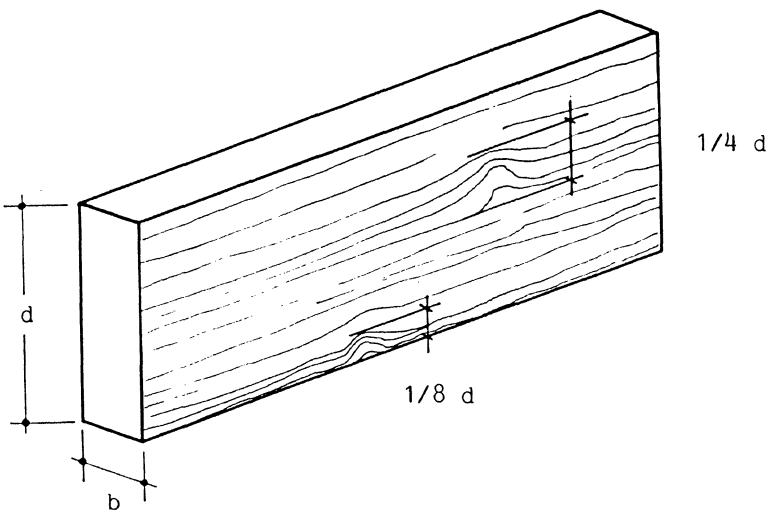
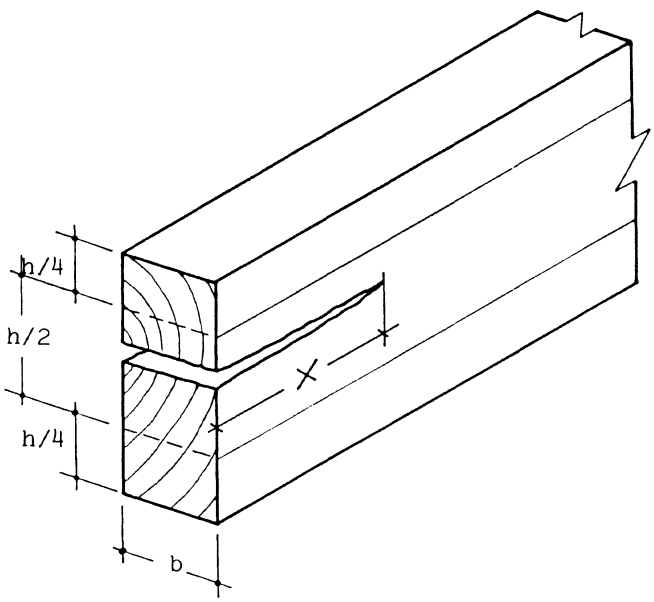


Figure 6. Criteria to measure localized grain deviation.



Size limits of splits for all classes

"General rule"	X < width (h)
"Timbers rule"	X < width (h)
"Dimension and boards rule"	X < width (h)
"Industrial rule"	X < ½ width (h)

The splits are measured as the average penetration of a split from the end of the piece, parallel to its edges.

Only the splits that occur within the central portion (h/2) are taken into account.

Figure 7. Measurement of splits and checks on the ends of pieces.

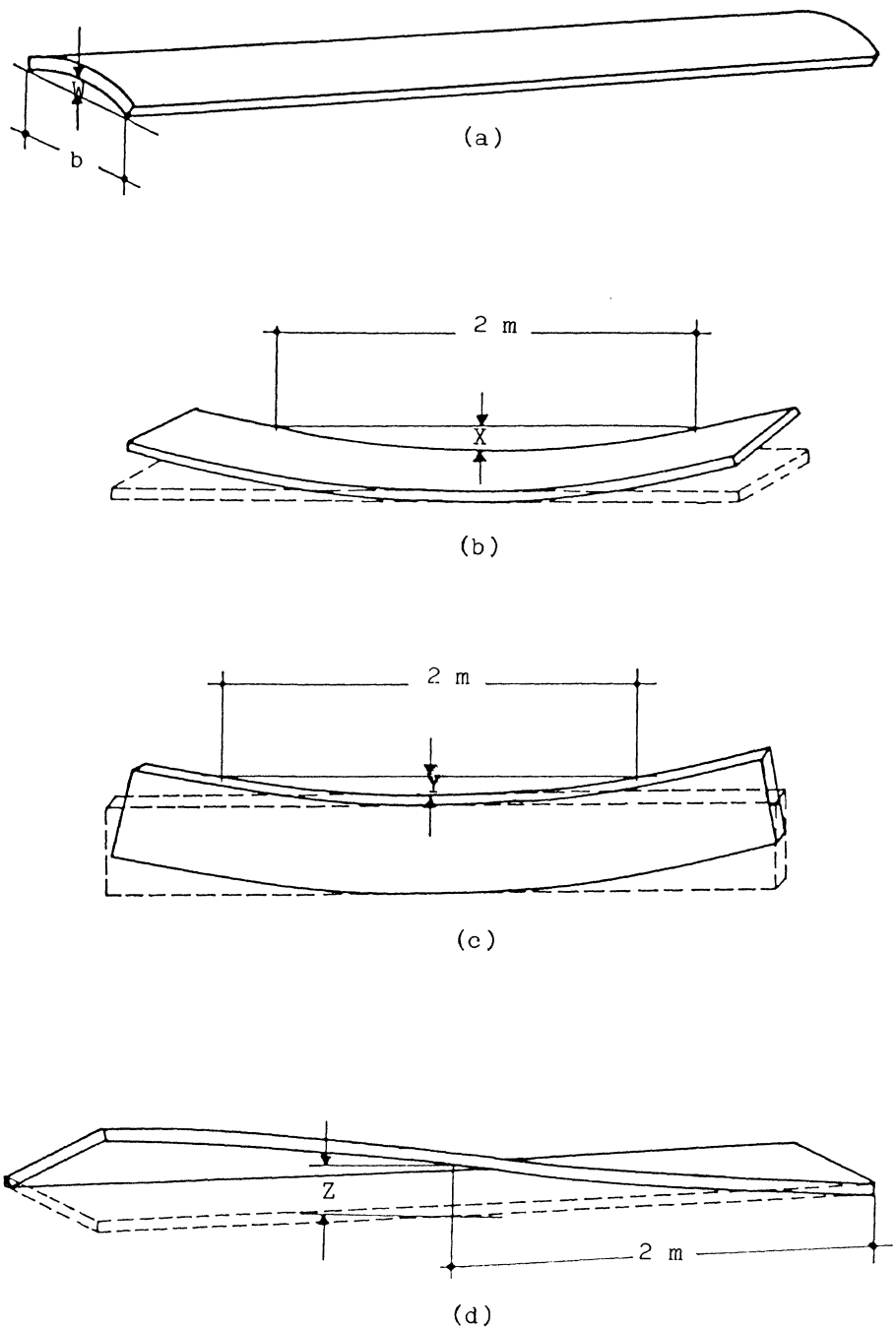


Figure 8. Ways to measure warp a) cup b) bow c) crook and d) twist.

DESCRIPTION OF THE GRADING RULES

To grade structural lumber, one has to take into account all the properties and characteristics that affect in a negative way its rigidity and strength. The present rules classify the lumber in three structural qualities: class A, class B and class G, identify the pieces in the following way according to the rule used:

"General rules"	class A class B class G	
"Special rules"	class PA or VA class PB or VB class G	For timbers 87 x 87 mm and 87 x 190 mm
	class SA class SB class G	For cross sections of 38 mm in thickness "Dimension and boards"
"Industrial rules"	class AA class BB class G	For cross sections of 38 mm of thickness and up to 240 mm in width.

The main difference between the types of rules are the maximum allowable sizes of knots specified in tables 1,2, and 3 for the "General", "Special" and "Industrial" rules respectively. Also the additional conditions detailed in table 4 need to be applied for all rules.

CLASSIFICATION PROCEDURE

The following steps are recommended to be followed when grading a piece of pine lumber for structural purposes:

a. A piece is inspected along its whole length and the greatest defect present is identified, which in most cases corresponds to knots.

b. Once identified the projection of that knot and others within the same length of 15 cm, gives the area to be used for grading.

c. First one decides if the piece is classified as G (i.e. outside the specified defect ranges on p.144); if not, it is inspected to see whether it meets the requirements of A, and if it is not A or G, by elimination it belongs to class B.

d. Once the piece has been inspected and classified according to the knots, then the general considerations appearing in table 4 are applied to arrive at the final classification of the piece.

Table 1. Maximum allowable size of knots according to the "General" rule.*

Class**	Maximum size of total area of knot (A_n)	Maximum size of edge knot area (A_{nc})
A	$\frac{1}{4}$ of A_t	1/8 of A_t
B	$\frac{1}{4}$ of A_t	without restriction

* The "General" rule can be applied to any cross section specified in standard NOM-C-224-1983, Appendix 1.

** The pieces classified with this rule should be identified with the letter shown in this column.

Table 2A. Maximum allowable size of knots according to the "Special" rule. For timbers 87 x 87 mm used as columns and 87 x 190 mm used as beams.

Class*	Maximum size of total area of knot (A_n)	Maximum size of edge knot area (A_{nc})
PA, VA	1/3 of A_t	645 mm^2
PB, VB	1/3 of A_t	1/5 of A_t

* The pieces with the square cross section classified with this rule, should be identified with the letters PA or PB, and those with the rectangular cross section with the letters VA or VB.

Table 2B. Maximum allowable size of knots according to the "Special" rule. For cross sections of 38 mm in thickness and up to 140 mm in width.

Class*	Maximum size of total area of knot (A_n)	Maximum size of edge knot area (A_{nc})**
SA	$\frac{1}{2}$ of A_t	0
SB	$\frac{1}{2}$ of A_t	1/8 of A_t

* The pieces classified with this rule should be identified with the letters shown in this column.

** In cross sections greater than 140 mm in width, edge knot area of up to 645 mm^2 is allowed.

Table 3. Maximum allowable size of knots according to the "Industrial" rule. For pieces of cross sections of 38 mm in thickness and up to 240 mm.

Class*	Maximum size of total area of knot (A_n)	Maximum size of edge knot area (A_{nc})
AA	$\frac{1}{4}$ of A_t	0
BB	$\frac{1}{4}$ of A_t	1/8 of A_t

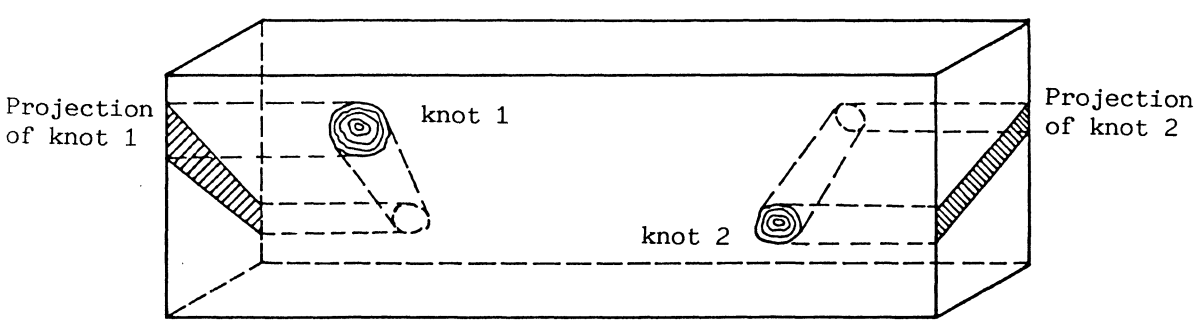
* The pieces classified with this rule should be identified with the letters shown in this column.

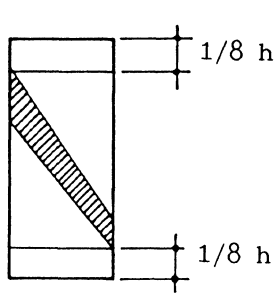
Table 4. General considerations to be used with any of the three types of rules.

CONCEPT	CLASS A	CLASS B
Maximum allowable slope of grain	1:10	1:8
Maximum allowable wane	¼ of thickness or width	1/3 of thickness or width
Insect attack	Maximum = 10 holes in a square 6.0 x 6.0 cm. No active infestation is allowed.	
Resin pockets	Are considered as knots. When the resin extends across the thickness, X, it is considered as a split (figure 5).	
Splits and shake	The length X should be less than the width d of the piece. For the "Industrial" rule the length X should be less than ½ d of the width of the piece.	
Local grain distortion	In the zones adjacent to the edges should be up to 1/8 the width (d). In the centre zone should be up to ¼ of the width (d).	
Decay	None is allowed	
Combination of defects	When more than half of the piece is blue stained, has insect attack, and is excessively light in weight, it is classified as G.	
Larva holes	A maximum size of 12 mm is accepted, and not more than two in a square of 6.0 x 6.0 cm	
Cup (W) (Figure 8)	Less than 1 mm for each 50 mm of width of the piece.	
Bow (X) in a length of 2 m (Figure 8)	Less than 20 mm for pieces of lumber of 38 mm of thickness. Less than 10 mm for pieces of lumber of 88 mm of thickness.	
Crook (Spring) (Y) in a length of 2 m (Figure 8)	Less than 10 mm for pieces of lumber of 88 mm of width. Less than 5 mm for pieces of lumber of 290 mm of width.	
Twist (Z) in a length of 2 m (Figure 8)	Less than 1.5 mm for each 12 mm of width of the piece.	
Compression wood	None is allowed	

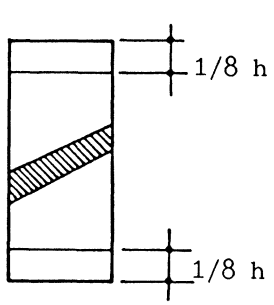
EXAMPLES

Example 1. A piece of pine lumber of 38 x 87 mm of cross section is to be graded. The drawing shows how the knots appear on the surface and how they would appear in the inside, and their projected area on the cross section. The "Special" rules will be used to grade it.





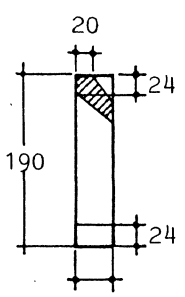
knot 1: $A_n < 1/2\ A_t$



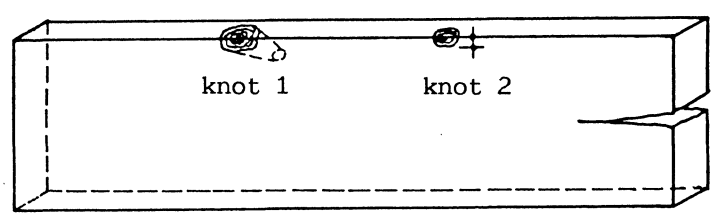
knot 2: $A_n < 1/2\ A_t$

Step 1. Knot 1 is the largest.
Step 2. Its projected area is less than the total area and does not occupy the adjacent zones to the edges. Thus it is class SA.
Step 3. Inspecting the considerations of table 4 one can see it meets the requirements of class A thus it remains graded as class SA.

Example 2. The piece of pine lumber has a cross section of 38 x 190 mm with knots as shown in the drawing. At one of the ends it has a split of 15.0 cm in length in the central portion of the cross section, local grain deviation on one of the edges 2 cm in width. The "Special" rules will be used to grade it. Measurements are in mm.



Projection of knot 1

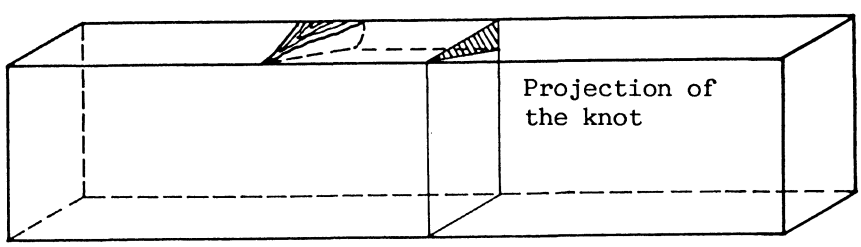


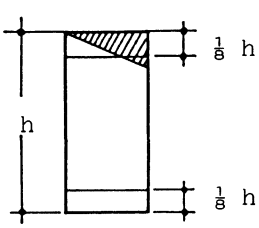
"Special" rule for this cross section.

Class SA ..... $A_n < A_t/2$ and $A_{nc} < 645$ mm^2
Class SB ..... $A_n < A_t/2$ and $A_{nc} < A_t/8$

Step 1. The largest defect knot 1 has a projected area less than half of the total area, thus it is not G, but the knot is within a zone adjacent to the edge.
Step 2. The projected area of the knot on the zone adjacent to the edge is less than 645 mm^2, thus it is classified as class SA.
Step 3. The local grain distortion is not greater than one eighth of the width, thus it remains class SA.
Step 4. The split in one of the ends is less than the width of the piece (x < d, 15 cm < 19 cm) thus it remains finally as class SA.

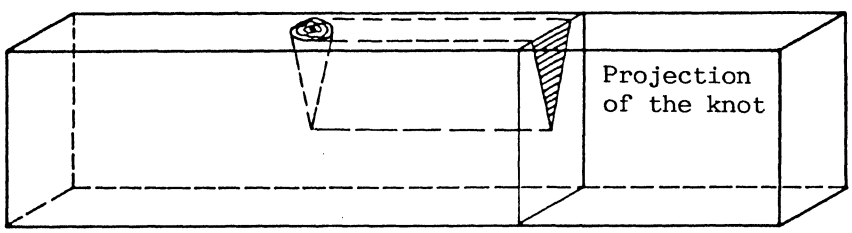
Example 3. Grade a piece of pine lumber of 87 x 190 mm, using the "Special" rule to do it.

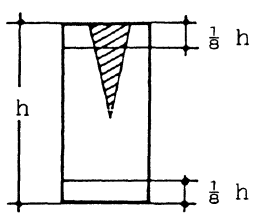




Step 1. The projected area of the knot is less than 1/3 A_t, thus it is not class G, but the knot is within a zone adjacent to the edge.
Step 2. The projected area of the knot in the zone adjacent to the edge is greater than 645 mm^2, thus it cannot be class VA, and does not occupy the whole area adjacent to the edge to be class G, consequently by elimination it is class VB.

Example 4. Grade a piece of pine lumber of 87 x 190 mm, using the "General" rule, to do it.





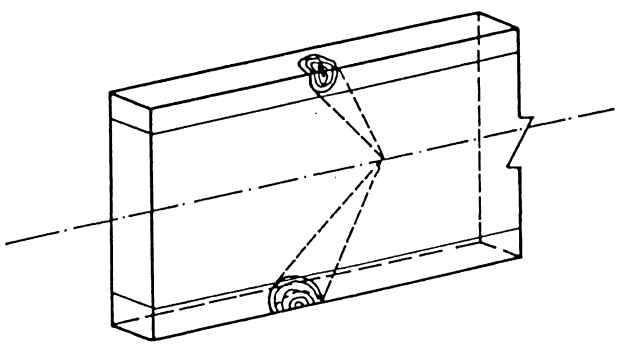
Step 1. The projected area of the knot occupies $\frac{1}{4}$ A_t of the total area, thus it is not class G, but the knot, at least part of it, is within a zone adjacent to one of the edges.

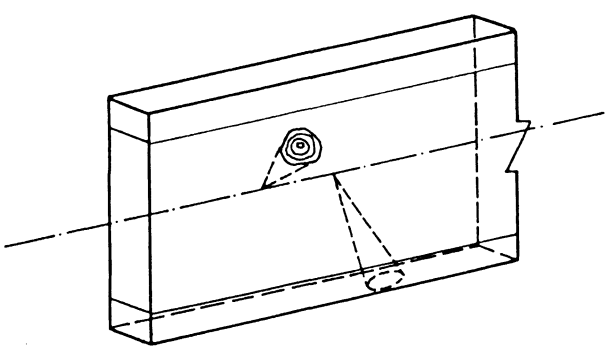
Step 2. The projected area of the knot does not occupy the whole area adjacent to the edge and it is A_{nc} < 1/8 At, thus it is classified as A.

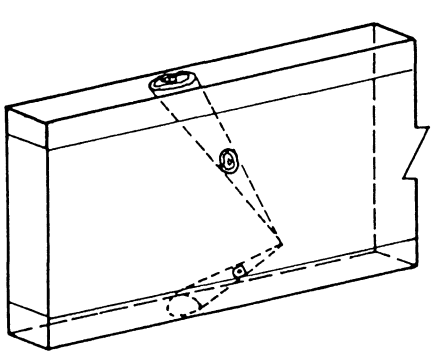
Example 5. "Typical" pieces of class SB when the "Special" rules are applied. When $A_n < \frac{1}{2} A_t$ but $A_{nc} < 645$ mm^2 and less than $1/8\ A_t$.

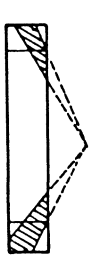
Pieces of 38 x 240 mm

Projection of knots

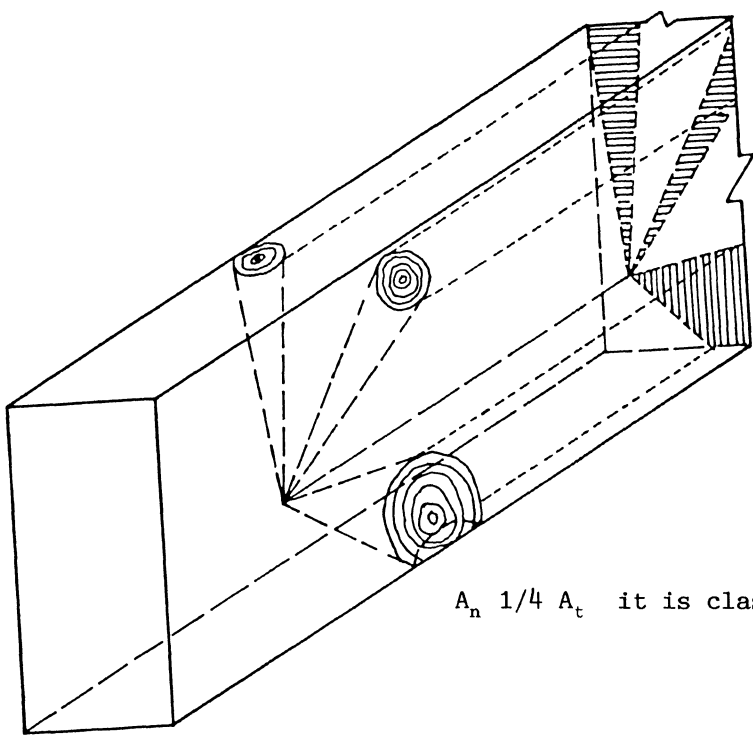






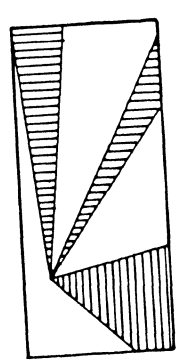


Example 6. Piece of class G when the "General" rules were applied. Cross section of 87 x 190 mm.



A_n 1/4 A_t it is class G

Projection of knots



APPENDIX 4

STRUCTURAL GRADES FOR TROPICAL BROADLEAVED TIMBERS

RESUMÉ OF DRAFT PROPOSAL FOR AN OFFICIAL MEXICAN STANDARD

These grading rules can be applied to tropical broadleaved species, to be used for structural purposes. They are to be used with dry lumber (moisture content $\leq$ 18 percent) and surfaced on the four sides. The dimensions of the lumber to be graded by these rules are the ones specified in standard NOM-C-224-1983, as shown in Appendix 2.

The rule defines only two grades, structural and non structural. The definitions of terms shown in Appendix 3 for pine lumber also apply for the tropical broadleaved species.

DESCRIPTION OF THE GRADING RULE

For a piece of lumber of a tropical species to be classified as of structural grade it must meet the following list of requirements.

1. Knot holes - Are allowed up to a maximum diameter of 4 cm on the faces of the piece or one sixth of the width, whichever is smaller. They are not allowed on the zones adjacent to the edges.
2. Sound knots - Are allowed up to a maximum diameter of 6 cm on the faces of the piece or one fourth of the width, whichever is smaller. They are not allowed on the zones adjacent to the edges.
3. Knots in clusters - Are not allowed.
4. Slope of grain - The maximum allowed slope of grain anywhere in the piece is 1:8. The piece will be classified as non-structural if there is a maximum allowed grain on both the face and the edge.
5. Checks - Are allowed with a moderate distribution. The sum of their depth measured from both sides should not exceed $\frac{1}{4}$ of the thickness of the piece.
6. Splits - Are allowed in only one of the ends, and with a length not greater than 1.5 times the width of the pieces. They are not allowed on the zones adjacent to the edges of the piece.
7. Larva holes - Up to two holes in a square of 6.0 x 6.0 cm are allowed. No active infestation is allowed.
8. Insect attack - Up to ten holes are allowed in a square of 6.0 x 6.0 cm. No active infestation is allowed.
9. Decay - None is allowed.
10. Compression failures - None is allowed.
11. Included pith - None is allowed.
12. Stains - Are allowed, when they represent changes in colour not involving decay.
13. Shake - Is allowed only on one face, up to $\frac{1}{4}$ the length of the piece, if it has a depth less than 3 mm.
14. Wane - Is allowed on only one edge, and not more than $\frac{1}{4}$ of thickness or width of the cross section, depending on the surface on which it is present.
15. Brittle heart - None is allowed.
16. Cup - Limited cup is allowed, not more than 2 percent of the width of the piece.

17. Bow - Less than 20 mm are allowed for each 2 m of length of the piece for pieces of 38 mm in thickness. For pieces of 88 mm in thickness only 10 mm are allowed for each 2 m of length.
18. Crook - Less than 10 mm are allowed for each 2 m of length of the piece for lumber of 88 mm in width. For lumber of 290 mm of width, only 5 mm for each 2 m of length of the piece is allowed.
19. Twist - Only less than 1.5 mm for each 25 mm of width, in a length of 2 m is allowed. It is only allowed on one edge.
20. A piece is to be classified as non-structural if within any of the following groups of defects, more than one is present with the maximum allowance.

    a) Cup, bow, crook, and twist.
    b) Slope of grain, and knots.
    c) Checks, splits, and shakes.
    d) Insect attack, and larva holes.

APPENDIX 5

PRESERVATION REQUIREMENTS FOR DIFFERENT TIMBERS UNDER DIFFERENT DEGREES OF HAZARD FROM ROT AND TERMITES.

This appendix lists in table 1 the minimum natural durability which is acceptable without preservative treatment for timbers to be used for the different end-uses in different hazard zones. The hazard zones are defined for Mexico for decay from fungus attack (rot) in Annex 1 and for termite attack in Annex 2. Belize is classified as a high hazard zone for all types of attack.

The classification of degrees of resistance of timbers to rot and subterranean termite attack and to dry wood termite attack are given below.

Resistance to rot and Subterranean termites.	Resistance to dry wood termites.
Very durable	Resistant
Durable	Moderately resistant
Moderately durable	Susceptible
Non-durable	Very susceptible
Perishable	

For definition of these hazard categories see paragraphs 3.3.7 and 3.38 in the main text of this guide.

To use the table for Mexico it is necessary to look up the hazard category, of the location where the timber is to be used, in Annexes 1 and 2 and then to see what is the minimum natural durability which is acceptable for the end use required in the particular hazard zone (ie durability or resistance to dry wood termites).

Table 1 lists either the minimum durability against rot and subterranean termites or the minimum resistance against dry wood termites for the different end-uses, the most severe hazard for a particular use being chosen to go into the table.

The natural durability of the woods is to be found in the main text tables giving properties of the timbers suitable for the different end-uses.

Notes on Table 1

1. Vacuum pressure treatment with creosote or copper-chrome-arsenate preservatives (CCA) is the only safe way of protecting timber in contact with the ground. Other treatments give lesser degrees of protection.

2. Boron diffusion treatment can be leached out of wood which is frequently wetted and should only be used where timber is kept protected from rain or standing water.

3. Double vacuum treatment is very effective for joinery and other purposes where movement of wood after treatment cannot be accepted. Waterborne CCA is less suitable for these purposes but can be used if rough sawn wood is treated then dried and machined and untreated machined surfaces touched up with a paint brush using a concentrated CCA solution or a non-water borne preservative.

4. Immersion treatments are inferior to other treatments and should only be used when others are not available.

5. Creosote leaves a dark, dirty oily surface and should only be used where this is acceptable and other forms of finishing are not to be used.

6. Finishing with painted coats of solvent borne permeable wood stains is recommended for exterior joinery and timber cladding. They are easy to apply, long lasting and easy to renew.

7. Treatments recommended are minimum treatments. All sapwood should be treated as perishable and where heartwood and sapwood are present treatment should be for the sapwood specification. For consignments of mixed species treatment should be as specified for the least durable woods in the consignment.

Table 1. Appendix 5. Preservation Requirements for Different Treatments and End-Uses.

1	2	3		4	5	6	7	8	9	10	11	12	13
Use Category	Table No.	Hazard		Durability category of heartwood that can be used without treatment	Preservative treatment for sapwood and less durable heartwood								Remarks
		Decay and subterranean termites	Dry wood termites		Pressure treatment				Boron diffusion	Double vacuum	Immersion		
					Creosote		CCA				Creosote	Oil solvent	
					Retention kg/m³	Penetration mm	Dry salt retention kg/m³	Penetration mm					
Buildings Structural Roofs	1	H M L	- - -	Durable Durable Mod durable			8.0 5.6 5.6	>6 >6 >6	YES YES YES	YES YES YES	Can be used if not exposed in interior of the building	YES YES YES	
Buildings Structural Walls and Floors	1	H M L	- - -	Very durable Durable Mod durable			8.0 5.6 5.6	>6 >6 >6	YES YES YES	YES YES YES		YES YES YES	
Buildings Non Structural Joinery - Exterior	3 and 4	H M L	- - -	Durable Durable Mod durable			8.0 5.6 4.0	>6 >6 >4	Could be useful if protected from direct rainfall	YES YES YES		YES YES YES	
Buildings Non-structural Joinery - Interior	5, 6 7, 8 9	- - -	H M L	Resistant Mod resistant Susceptible					YES YES YES	YES YES YES		YES YES YES	Required mainly for sapwood borers, and drywood termites
Furniture upholstered	12	- - -	H M L	Mod resistant Susceptible Susceptible						YES YES YES		YES YES YES	
Building shuttering	2	All zones		Non durable Susceptible								YES YES	If long life required use treatment.
Railway Sleepers	14	All zones		Very durable	250-300	>20	12-16	>20					Double treatment with CCA and creosote can be best
Packing and Pallets	13	All zones		Non durable					YES			YES YES	Only for long life for food boxes. Boron only.
Turnery	15 and 16	All zones		Non durable								YES	Only treat for exterior use and long life.

Annex 1

CLASSIFICATION OF POTENTIAL FOR DECAY AND SUBTERRANEAN TERMITES IN WOOD STRUCTURES ABOVE GROUND*

The following formula was used in determining the climatic index which was used to determine the potential for decay

$$\text{climatic index} = \frac{\sum_{\text{January}}^{\text{December}} (T - 2)(D - 3)}{16.7}$$

Where:

T = Monthly average temperature °C
D = Number of days in a month with a rainfall of $\geq$ 0.1 mm
$\sum_{\text{January}}^{\text{December}}$ = The sum of the products for the respective months from January to December
16.7 = A factor introduced so as to obtain climatic index values from 0 to approximately 100.

Zone of high risk (H) = Climatic index greater than 65
Zone of medium risk (M) = Climatic index between 35 and 65
Zone of low risk (L) = Climatic index between 0 and 35

Figure No 1 shows how the three risk zones are distributed in Mexico. Belize the whole country is classified as a zone of high risk.

Table No 1 List of main towns in Mexico at the classification of risk for decay in wood structures above ground.

State	Town	Climatic index	Risk of decay
Aguascalientes	Aguascalientes	35.44	M
Baja California Norte	Ensenada	1.57	L
Baja California Sur	La Paz	8.93	L
Campeche	Campeche	78.12	H
Coahuila	Monclova	16.41	L
	Piedras Negras	21.64	L
	Saltillo	22.05	L
	Torreón	5.59	L
Colima	Colima	78.49	H
	Manzanillo	70.13	H
Chiapas	Comitán	71.19	H
	San Cristobal las Casas	68.06	H
	Tapachula	192.85	H
	Tuxtla Gutiérrez	71.57	H
Chihuahua	Chihuahua	28.45	L
Distrito Federal	Tacubaya	83.28	H
Durango	Ciudad Lerdo	18.42	L
	Durango	42.94	M

* According to reference Perez-Morales et al., 1977.

México	Toluca	66.28	H
Guanajuato	Guanajuato	48.62	M
	Léon	53.09	M
Gueriero	Acapulco	73.79	H
	Chilpacingo	64.88	M
Hidalgo	Pachuca	39.89	M
	Tulancingo	55.82	M
Jalisco	Guadalajara	77.38	H
	Huejucar	47.01	M
Michoacan	Morelia	69.08	H
Nayarit	Tepic	76.70	H
Nuevo León	Monterrey	38.68	M
Oaxaca	Oaxaca	73.08	H
	Salina Cruz	51.44	M
Puebla	Puebla	76.48	H
Queretaro	Queretaro	39.87	M
Quintana Roo	Cozumel	112.33	H
San Luis Potosi	Río Verde	37.71	M
	San Luis Potosí	23.93	L
Sinaloa	Culiacán	48.95	M
	Maza Hán	43.70	M
Sonora	Ciudad Obregón	25.74	L
	Guaymas	4.50	L
	Hermosillo	18.11	L
Tamaulipas	Soto la Marina	16.26	L
	Tampico	65.49	H
Tlaxcala	Tlaxcala	67.43	M
Veracruz	Coatzacoalcos	169.16	H
	Córdoba	115.17	H
	Orizaba	171.35	H
	Veracruz	118.21	H
	Xalapa	130.91	H
Yucatán	Mérida	92.15	H
	Progreso	16.09	H

Annex 2

CLASSIFICATION OF RISKS OF ATTACK BY TERMITES*

1 Definition of degrees of risk of attack by subterranean termites

Zone of high risk (H) is the zone where buildings show attack by these termites quite frequently not only in the wood members in contact with the ground, but at heights above 60 cm, and there is evidence of severe damage of the structure within the first five years of its service life.

Zone of medium risk (M) is the zone where buildings show attack by these termites, only in wood members in contact with the ground or below a height of 60 cm above ground, and severe damage occurs only in structures, with more than five years of service life.

Zone of low or nil risk (L) is the zone where the buildings do not show the presence of this type of termite, or in exceptional cases, the damage detected is in wood members in contact with the ground or in buildings with more than 20 years of service life.

Figure No 2 Shows how these three risk zones are distributed in México. The whole of Belize is classified as a zone of high risk.

2 Definition of degree of risk of attack by dry-wood termites.

Zone of high risk (H) is the zone where buildings show severe damage, in the structural members as well as doors, and windows, or within a period of 5 to 10 years of service life there is a generalised damage of the buildings by this type of termite.

Zone of medium risk (M) is the zone where buildings show severe damage, in the structural members after 10 years of service life. Generally the damage is restricted to areas exposed in different ways to being wetted by rain or other sources of humidity (ends of roof beams exposed to the weather, lower portion of doors and window) and its ocurrence is not generalised in the buildings but it is rather sporadic.

Zone of low or nil risk (L) is the zone where buildings generally do not show damage by this type of termite. When the damage is present, it is in buildings with more than 20-25 years of service life, and the damage is not severe. (The structural integrity of the building is not in danger).

Figure No 3 shows how these three risk zones are distributed in Mexico. The whole of Belize is classified as a zone of high risk.

* According to Perez-Morales and Echenique-M, 1989.

Table No 2 List of main towns in Mexico and the classification of risk to attack by subterranean and dry-wood termites.

State	Town	Risk for subterranean termites	Risk for dry-wood termites
Aguascalientes	Aguascalientes	L	M
Baja California Norte	Ensenada	M	M
	Mexicali	M	M
	Tijuana	M	H
Baja California Sur	Guerrero Negro	M	M
	La Paz	M	M
	Loreto	M	M
	Santa Rosalía	M	M
Campeche	Campeche	H	H
	Ciudad del Carmen	H	H
Coahuila	Saltillo	L	M
	Torréon	L	M
Colima	Colima	H	H
	Munzanillo	H	H
Chiapas	Cintalapa	H	H
	Comitán	H	H
	Ocozoncuautla	H	H
	San Cristóbal las Casas	L	L
	Teopisca	L	M
Chihuahua	Ciudad Juárez	M	M
	Chihuahua	L	M
	Parral	L	M
Durango	Cuencame	L	M
	Durango	L	M
	Gómez Palacios	L	M
	Guadalupe Victoria	L	L
México	Toluca	L	L
Guanajuato	Guanajuato	M	M
	Irapuato	M	M
	León	M	M
Guerrero	Acapulco	H	H
	Chilpacingo	L	M
	Coyuca de Benites	H	H
	Iguala	M	M
	San Marcos	H	H
	Taxco	M	M
	Tecpan de Galeana	H	H
	Zihuatanejo	H	H
Hidalgo	Mixquiahuala	L	M
	Pachuca	L	M
Jalisco	Chamela	H	H
	Guadalajara	L	M
	Puerto Vallarta	H	H
Michoacan	Morelia	L	M
	Playa Azul	H	H
	Pátzcuaro	L	M
	Quiroga	L	M
	Uruapan	L	M
	Zamora	L	M
	Zitácuaro	L	M

Morelos	Cuernavaca	L	M
Nayarit	Ixtlán del Río	L	M
	Tepic	H	H
Nuevo Léon	Monterrey	M	M
Oaxaca	Oaxaca	L	H
	Pinotepa Nacional	H	H
Puebla	Huajapan	L	H
	Puebla	L	M
Querétaro	Querétaro	M	M
	San Juan del Río	M	M
Quintana Roo	Bacalar	H	H
	Cancún	H	H
	Chetumal	H	H
	Felipe Carrillo Puerto	H	H
	Puerto Juárez	H	H
San Luis Potosí	San Luis Potosí	M	M
Sinaloa	Culiacán	H	H
	Mazatlán	H	H
Sonora	Ciudad Obregón	H	H
	Guaymas	H	M
	Hermosillo	H	M
	Novojoa	H	H
	San Luis Río Colorado	M	M
	Santa Ana	M	M
Tabasco	Villahermosa	H	H
Tamaulipas	Ciudad Victoria	M	M
	Matamoros	M	M
	Nuevo Laredo	M	M
	Reynosa	M	M
Veracruz	Coatzacoalcos	H	H
	Córdoba	M	H
	Huatusco	M	H
	Orizaba	M	H
	San Andrés Tuxtla	H	H
	Tuxpan	H	H
	Vexacruz	H	H
	Xalapa	M	H
Yucatan	Mérida	M	H
	Progreso	M	H
	Valladolid	M	H
Zacatecas	Fresnillo	L	M
	Zacateras	L	M

APPENDIX 6

APPEARANCE GRADES FOR PINE TIMBER

RESUMÉ OF OFFICIAL MEXICAN STANDARD NOM-C-18-1986.

These grading rules can be applied to pine lumber of all species, to be used for other than load bearing structural purposes, such as furniture, general carpentry, etc.

The lumber classified under these rules can fall into one of six qualities:

Class A - Select

Class B - First

Class C - Second

Class D - Third

Class E - Fourth

Class F - Discard

The nominal dimensions of the pine lumber graded with these rules are as follows:

Thickness (mm)	Width (cm)	Length (m)
13	10	0.61
19	15	0.91
25	20	1.22
38	25	1.52
51	30	1.83
76		2.13
89		2.44
101		2.52
		3.05
		3.66
		4.27
		4.88
		5.48
		6.10

The moisture content of the pieces to be classified as follows:

With a moisture content of less than 12% = Dry

With a moisture content between 12 and 20% = Semi-dry

With a moisture content above 20% = Wet

The boards when sawn from the green logs should have the following oversizes in order to account for shrinkage. For pieces with a thickness up to 38 mm the oversize should be 3 mm, those pieces with greater thickness should have a 5 mm oversize. With respect to width the pieces should have an oversize of 13 mm, and in relation to their length the amount should be 25 mm.

The definitions of terms given in Appendix 3 for pine lumber for structural purposes also apply for these rules.

DESCRIPTION OF THE GRADING RULE.

Class "A" Select

1 Timber must be uniformly sawn and free from warp.

2 It must not contain knots of any sort.

3 Its colour must be uniform, and must not have stains of any sort.

4 No decay, resin pockets, larva holes, or insect attack are allowed.

5 No splits or checks are allowed on the edges or faces. On the ends splits are allowed with a maximum or 1 mm in width and 13 mm in length.

6 The grain should be straight, so that when the piece is planed, no defects appear such as chipped or torn grain.

Class "B" First

1 Timber must be uniformly sawn and free from warp.

2 It must have a clear face while in the other slight defects are allowed.

3 The clear face must meet the requirements of Class "A".

4 The other face can have the following defects

4.1 Sound knots no larger than 19 mm in diameter, numbering not more than one per 1.22 m of length.

4.2 Slight stains are allowed that do not exceed 20 percent of the surface.

4.3 Timber must meet the requirements mentioned in 4 and 5 of Class "A".

Class "C" Second

1 Timber must be uniformly sawn and free from warp.

2 One sound knot is allowed in one of the faces with a maximum diameter of 38 mm, or several sound knots whose sum of diameters does not exceed the maximum diameter of 38 mm.

3 Resin patches are allowed that on each face cover an area not greater than 25 mm in width and 30.5 cm in length. Mild blue stain, is allowed, on both faces that could cover the entire surfaces.

4 Insect holes are allowed, with a diameter not greater than 3 mm, scattered throughout the faces, with a maximum of eight in a surface of 30 cm x 2.44 m.

5 Checks are allowed on the faces that do not exceed 3 mm in width, 3 mm in depth and 30 cm in length. On the ends splits are allowed not greater than 4 mm in thickness and 20 cm in length.

6 Slight inclined grain is allowed, as well as slight warp in the longitudinal and transverse directions.

Class "D" Third

1 All types of sound knots are allowed, but not more than one shall have a maximum diameter of 38 mm for each section of 91 cm of length.

2 Stains or changes of colour of whatever intensity or size are allowed.

3 Resin patches are allowed, up to 33 percent of the surface per face, and resin pockets with a maximum size of 20 mm in width and 25 cm in length.

4 Insect holes are allowed, with a maximum diameter of 6 mm, but they must not go across the whole thickness of the piece.

5 Decayed portions are allowed not exceeding one sixth of the width, by one eighth of the length of the piece.

6 Checks are allowed not greater than 6 mm in width, and 6 mm in depth by 60 cm in length. On each of the ends splits are allowed not exceeding 8 mm in width and 40 cm in length.

7 Deviations from a straight grain are allowed, together with warp up to 25 mm lengthwise and 12 mm across the board for each 2.44 m in length.

Class "E" Fourth

1 All types of knots are allowed, and with not more than one with a maximum diameter of 38 mm in each section of 61 cm of length.

2 Stains or changes of colour of whatever intensity or size are allowed.

3 Resin patches are allowed up to 80 percent of the surface per face, and resin pockets with a maximum size of 30 mm in width and 50 cm in length.

4 Insect holes are allowed.

5 Decayed portions are allowed not exceeding one fourth of the width, by one sixth of the length of the piece.

6 Checks are allowed not greater than 9 mm in width, 9 mm in depth by 90 cm in length. On each of the ends, splits are allowed not exceeding 12 mm in width and 60 cm in length.

7 Deviations from straight grain are allowed, together with warp up to 38 mm lengthwise and 19 mm across the board for each 2.44 m in length.

Class "F" Discard.

Timber that does not meet the requirements for class "E" Fourth.

APPENDIX 7

APPEARANCE GRADES FOR BROADLEAVED TIMBERS

Resumé of modified Malaysian Grading Rules.

These rules can be applied to the grading of timber of all species for general purpose uses. Grading for specialised uses such as flooring strips or blocks may require the use of other rules.

The rules include the following grades:

Prime (First Grade)
Select (Second Grade)
Standard (Third Grade)
Sound (Fourth Grade)
Serviceable (Fifth Grade)

The nominal dimensions of the timber to be graded with these rules are as follows:

Thickness (mm)	Width (cm)	Length (m)	
13	7.5	0.61	]
19	10	0.91	]
25	15	1.22	] Shorts
38	20	1.52	]
51	25	1.83	]
76	30	2.13	]
89		2.44	]
101		2.52	]
		3.05	]
		3.66	] Full length timber
		4.27	]
		4.88	]
		5.48	]
		6.10	]

Any combination of thickness width and length can be used but timber under 1.83 m in length is classified as a "short" and will normally sell at a lower price than full length timber.

Moisture content

The following moisture content classification will be used as measured by oven drying and weighing or by moisture meter.

Dry - less than 12% mc
Semi-dry - 13-20% mc
Wet (Green) - over 20% mc

Green timber should be cut oversize by approximately 5% in thickness and width in order to attain nominal dimensions when dried to 12% mc. This amounts to 1.25 mm per 25 mm of thickness and 1.5 cm per 30 cm of width. There is no need to cut oversize for length.

Description of Grade Specifications

1 Prime Grade (First)

- Widths: 15 cm and up
- Lengths: 3 m and up
- Sapwood: none permitted
- Knots: The average diameter of knot shall not exceed one-third the width of the face on which it appears.

- Spring: Shall not exceed the proportion of one part in one-hundred and forty-four parts of length of the piece.

- Warp not permitted if surfacing both sides to standard surfaced thickness is not possible.

- Cutting requirements: Admits pieces that will yield clear face cuttings as shown below. The portion outside the clear face cuttings will admit splits not more than a twelfth of the length of the piece.

  Percentage of the face that must be clear of defect is 90%.

  Minimum size of clear face cuttings 1500 cm^2.

Select Grade (Second)

- Widths: 12.5 cm and up.

- Lengths: 2.5 m and up.

- Sapwood: Bright sapwood is permitted up to a third of the width of the piece.

- Knots: As for Prime Grade.

- Spring: As for Prime Grade.

- Warp: Not permitted in less than 25 cm widths. Over 25 cm it is permitted if ripping into two pieces would allow both pieces to surface both sides to standard surfaced thickness.

- Cutting requirements: percentage of clear face must be over 75% of the piece with splits permitted outside the area of clear face as for Prime Grade. Minimum size of clear face cuttings 900 cm^2.

Standard Grade (Third)

- Widths: 10 cm and up.

- Lengths: 1.83 m and up.

- Sapwood: Bright sapwood shall not be regarded as a defect.

- Spring: Shall not exceed the proportion of one part in 96 parts of length of the piece.

- Warp: as for Select Grade.

- Cutting requirements: Two-thirds of the face should yield clear cuttings. Outside the cuttings splits will be allowed as in Prime Grade plus any sound defect not materially affecting the strength of the timber. Minimum size of clear face cuttings 675 cm^2.

Sound Grade (Fourth)

As for Standard Grade except that small borer holes are permitted provided they are not so numerous as to materially affect the strength of the timber.

Serviceable Grade (Fifth)

- Widths: 10 cm and up.

- Lengths: 1.83 m and up.

- Wane: Allowed on the worst face and one edge only not to exceed one-sixth of the width of the piece.

- Brittle Heart: Allowed on one face and one edge provided the strength of the piece is not materially affected; may be included in cuttings.

- Spring: As in Standard Grade.

- Warp: As in Standard Grade.

- Cutting requirements: As for Standard Grade except cuttings must be sound face cuttings and areas outside cuttings will admit any defects not materially affecting the strength of the timber. Small borer holes not materially affecting strength will be permitted in all timber.

Ungraded

Any timber falling outside the requirements of the above grades.

Cutting tolerance

Sawnwood graded by these rules should in general be evenly cut with parallel sides and not below nominal size nor over the specified cutting dimensions by more than 3 mm in thickness or width. Some irregularity in cutting and, undersize cutting up to 1 mm of thickness or width may by permitted in Sound and Serviceable Grades only.

Figure No. 1 Map of risk of decay in wood structures above ground.

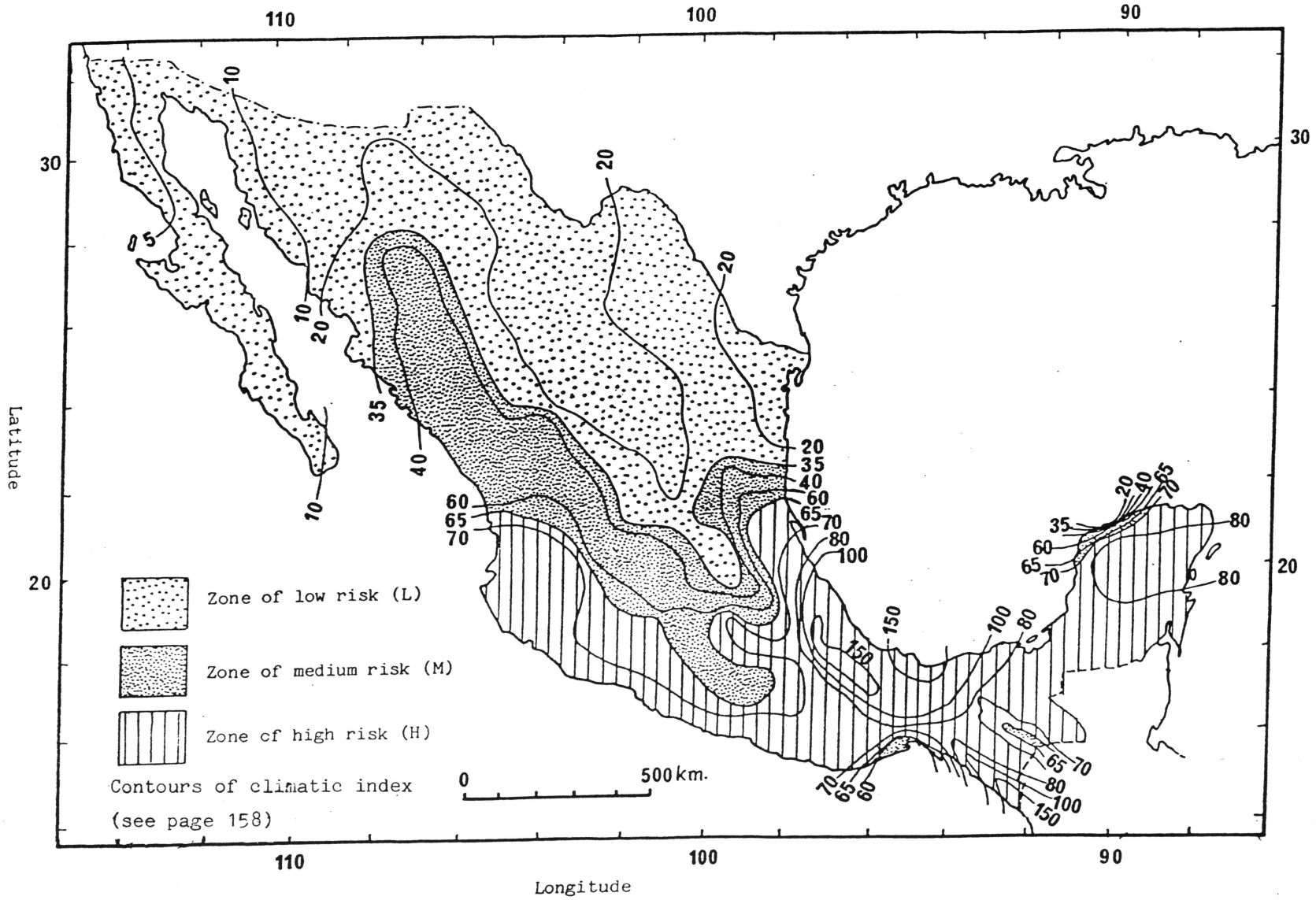


Figure No. 2 Map of risk of attack to wood structure by SUBTERRANEAN TERMITES

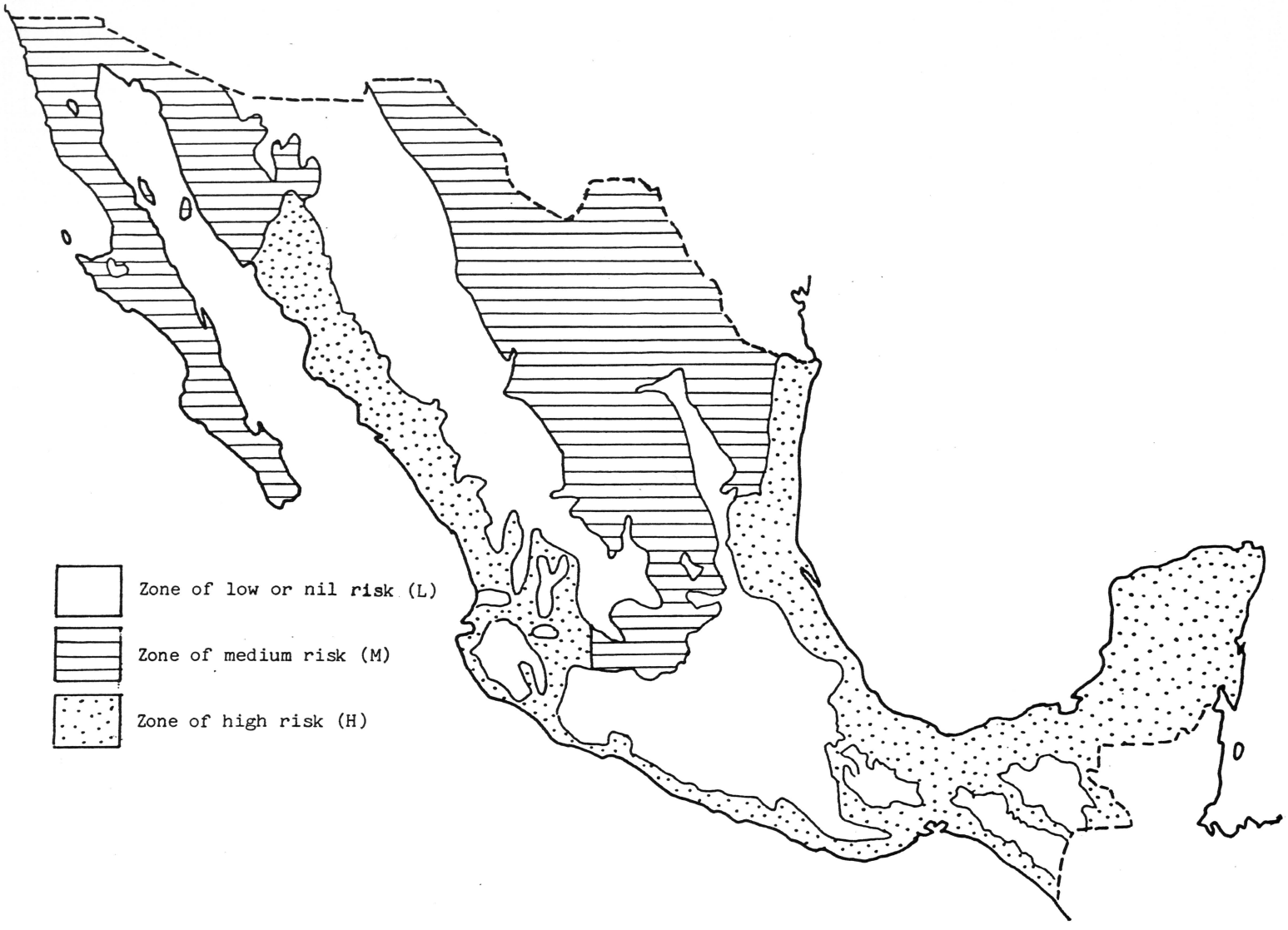
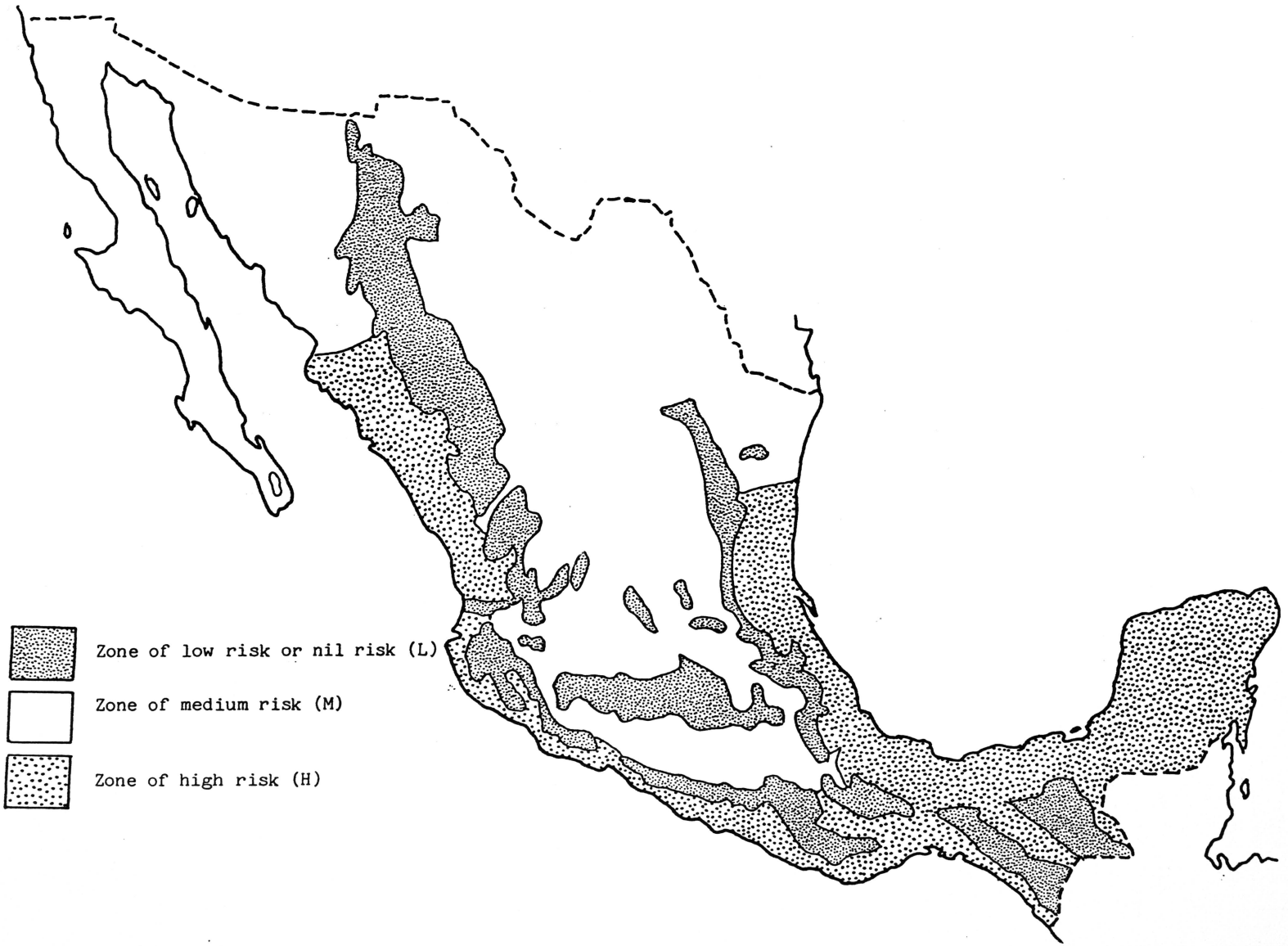


Figure No. 3 Map of risk of attack to wood structures by DRY-WOOD TERMITES.



INDEX

List of Species by Botanical Names in Alphabetical Order

Number	Name	Table Number	Commercial Name
1	Abies spp.	1, 2, 3, 4, 5, 11, 12, 13	Fir
2	Acer skutchii	8, 9, 10	Alamo Plateado
3	Alchornea latifolia	1, 2, 3, 4, 5, 9, 12, 13	Coton de caribe
4	Alnus acuminata	11, 16, 17	Aile
5	Alseis yucatanensis	1, 2, 8, 16	Wild mamee
6	Ampelocera hottlei	3, 5, 7, 8, 10, 15, 18	Luin
7	Anacardium excelsum	1, 2, 3, 4, 5, 6, 9, 10, 12, 13	Espave
8	Andira inermis	1, 3, 5, 8, 10, 16, 17, 18	Angelin
9	Aspidosperma megalocarpon	5, 7, 8, 10, 14, 15, 18	Mylady
10	Astronium graveolens	7, 8, 10, 14, 15	Palo mulato
11	Blepharidium mexicanum	5, 8, 17, 18	Popiste
12	Bombacopsis quinatum	2, 3, 5, 9, 10	Cedro espino
13	Brosimum alicastrum	1, 3, 5, 7, 8, 10, 15	Breadnut
14	Bucida buceras	7, 8, 14	Bullet tree
15	Bursera simaruba	1, 2, 9, 12, 13, 17	Red gombolimbo
16	Caesalpinia granadillo	10, 18	Partridge wood
17	Calophyllum brasiliense	1, 8, 9, 11, 14, 15	Santa Maria
18	Calycophyllum candidissimum	7, 8, 10, 16, 17, 18	Degame
19	Carapa guianensis	1, 2, 11	Bastard Mahogany
20	Carya ovata	15	Nogal Motudo
21	Cedrela odorata	3, 5, 6, 9, 10, 18	Cedar
22	Cordia alliodora	1, 2, 3, 5, 6, 9, 10	Salmwood
23	Cordia dodecandra	10, 18	Ziricote
24	Cymbopetalum penduliflorum	1, 2, 9, 12, 13	Orejuelo
25	Dalbergia retusa	18	Granadillo
26	Dalbergia stevensonii	18	Rosewood
27	Dendropanax arboreus	1, 2, 9, 12, 13	Sac Chacah
28	Dialium guianense	7, 8, 14, 15	Ironwood
29	Didymopanax morototoni	1, 2, 3, 5, 6, 9, 12, 13	Morototo
30	Dipholis salicifolia	7, 8, 14, 18	Bustic
31	Dipholis stevensonii	7, 8, 14, 15, 18	Guaité
32	Enterolobium cyclocarpum	1, 2, 5, 9, 11	Tubroos
33	Genipa americana	7, 8, 10, 14, 16, 17	Genipa
34	Gliricidia sepium	16, 17	Cacahuananche
35	Guarea glabra	3, 5, 6, 8, 9, 10, 16, 17	Cramantee
36	Guatteria anomela	1, 2, 5, 9, 10, 12, 13	Zopo
37	Hieronyma alchorneoides	7, 8, 14, 16, 17	Urucurana
38	Hura crepitans	1, 2, 9, 11, 12, 13	Possumwood
39	Hymenaea courbaril	7, 8, 10, 14, 15, 18	Courbaril
40	Jacaranda copaia	1, 2, 6, 9, 11, 12, 13	Copaia
41	Libocedrus decurrens	18	Pencil Cedar
42	Licania platypus	2, 8, 11,	Monkey Apple
43	Liquidambar styraciflua	1, 2, 9, 12, 13	Liquidambar
44	Lonchocarpus castilloi	7, 8, 14, 15, 18	Black Cabbage Bark
45	Lonchocarpus hondurensis	1, 3, 4, 5, 10, 14, 15, 18	Palo Gusano
46	Luehea seemannii	3, 5, 9, 10	Yayo
47	Lysiloma acapulcensis	1, 2, 3, 4, 5, 6, 8, 9, 10, 15, 18	Tepehuaje
48	Lysiloma bahamensis	1, 3, 5, 8, 10, 18	Tzalam
49	Maclura tinctoria	7, 8, 10, 14	Fustic
50	Magnolia schiedeana	8, 9, 10	Magnolia
51	Manilkara zapota	7, 8, 14	Sapodilla
52	Matayba oppositifolia	10	Zacuayum

53	Metopium brownei	7, 8, 10, 18	Chechem
54	Mirandaceltis monoica	7, 8, 14, 18	Chicharra
55	Misanteca peckii	5, 8, 10, 16, 17	Pimientillo
56	Mosquitoxylon jamaicense	1, 2, 3, 4, 5, 8, 10, 14	Pajulté
57	Myroxylon balsamum	10, 18	Balsamo
58	Ormosia toledoana	1, 2	Hormiga
59	Pachira aquatica	1, 2, 5, 8, 9, 12, 13, 16, 17	Provision tree
60	Peltogyne pubescens	7, 8, 10, 18	Amaranth
61	Persea americana	1, 2, 9, 11, 12, 13	Aguacate
62	Pinus spp. (P. caribaea + P. oocarpa)	1, 2, 3, 4, 5, 6, 9, 11, 12, 13, 14, 16, 17	Pine
63	Pinus ayacahuite	6, 10	Ayacahuite
64	Pinus lambertiana	6	Pine
65	Pinus patula	8	Pino Colorado
66	Pinus ponderosa	6, 10	Ponderosa pine
67	Pinus pseudostrobus	6, 10	Pine
68	Pinus teocote	8	Ocote
69	Piscidia communis	7, 8, 14	Jabin
70	Pithecellobium arboreum	1, 3, 4, 5, 8, 10, 14, 16, 17, 18	Barba jolote
71	Pithecellobium leucocalyx	1, 2, 3, 4, 5, 8, 9, 10, 13, 14	Guaciban
72	Platymiscium pinnatum	18	Palo santo
73	Platymiscium polystachyum	10	Panama Rosewood
74	Platymiscium yucatanum	10, 16, 17, 18	Granadillo
75	Poulsenia armata	2, 9, 13	Masamorro
76	Pouteria campechiana	7, 8	Kaniste
77	Prosopis juliflora	3, 5, 7, 8, 10, 15	Mesquite
78	Pseudobombax ellipticum	5, 9, 10, 13, 15	Amapola
79	Pterocarpus hayesii	1, 2, 5, 9, 11, 12, 13	Palo de Sangre
80	Quararibea funebris	1, 2, 3, 6, 9, 10, 11, 13	Molinillo
81	Quercus acatenangensis	7, 8, 10, 15	Oak
82	Quercus anglohondurensis	7, 8, 13, 14	Oak
83	Quercus crassifolia	7, 8, 10, 15	Oak
84	Quercus germana	8, 10, 15	Encino Blanco
85	Quercus rugosa	8, 13, 15	Encino Roble
86	Quercus skinneri	7, 8, 13, 14, 15	Oak
87	Roseodendron donnell-smithii	3, 5, 6, 9, 10	Primavera
88	Schizolobium parahybum	9, 13	Quamwood
89	Sebastiana longicuspis	5, 6, 8, 9, 11, 16, 17	Chechen Blanco
90	Sickingia salvadorensis	5, 8, 13, 14, 15, 18	Chacahuante
91	Simarouba glauca	1, 2, 3, 4, 5, 6, 9, 10, 12, 13, 17	Negrito
92	Spondias mombin	1, 2, 3, 4, 5, 9, 11, 12, 13	Hogplum
93	Sterculia apetala	2, 3, 4, 6, 11, 12, 13, 16	Bellota
94	Swartzia cubensis	7, 8, 14, 15, 18	Corazón Azul
95	Sweetia panamensis	7, 8, 14, 15, 18	Billy Webb
96	Swietenia macrophylla	3, 5, 6, 9, 10. 18	Mahogany
97	Symphonia globulifera	1, 2, 3, 5, 8, 9, 10	Waika Chewstick
98	Tabebuia rosea	3, 5, 6, 9, 10, 16, 17	Apamate
99	Talauma mexicana	1, 2, 5, 8, 9, 10, 12, 13	Jolmashte
100	Talisia olivaeformis	7, 8	Guaya
101	Tapirira guianensis	1, 2, 3, 4, 5, 6, 9, 10, 12, 13, 16, 17	Southern Wild Mahogany
102	Terminalia amazonia	1, 3, 5, 7, 8, 10, 14, 15, 18	Nargusta
103	Vatairea lundellii	1, 3, 4, 5, 8, 9, 10, 14	Bitterwood
104	Virola koschnyi	1, 2, 3, 4, 5, 6, 9, 11, 12, 13, 16, 17	Banak
105	Vitex gaumeri	1, 2, 5, 6, 8, 10, 15, 17	Fiddlewood
106	Vochysia hondurensis	1, 3, 4, 5, 9, 10, 12, 13	Yemeri
107	Wimmeria bartletti	7, 8	Chintoc
108	Zanthoxylum beliziense	2, 5, 9, 11, 13	Prickly Yellow
109	Zuelania guidonia	5, 8, 10, 14, 16, 17	Trementino

List of Species by Mexican Name in Alphabetical Order

Name	Number on Botanical List
Aguacate	61
Aile	4
Amapola	78
Amargoso	103
Apompo	59
Arce	2
Bálsamo	57
Barí	17
Bellota	93
Cacahuananche	34
Camarón	18
Candelero	29
Canshán	102
Caoba	96
Cedrillo	35
Cedro rojo	21
Chacáh	15
Chacahuanté	90
Chakté	95
Chechem Blanco	89
Chechem Negro	53
Chicozapote	51
Chintoc	107
Colorín	58
Corazón azul	94
Coton de Caribe	3
Encino	81, 82, 83, 84 85, 86
Frijolillo	70
Gateado	10
Granadillo	25, 74
Guaité	31
Guanacaste	32
Guapinol	39
Gusano machiche	45
Habillo	38
Jabín	69
Jobo	92
Kanisté	76
Lagarto	108
Liquidambar	43
Luin	6
Maca Blanca	106
Machiche	44
Maculís	98
Magnolia	50
Mano de danta	27
Maquilla	8
Masamorro	75
Mesonzapote	42
Mesquite	77
Molenillo	80
Mora	49
Nogal Motudo	20
Orejuelo	24
Oyamel	1
Palo de sangre	79
Papelillo	5
Paque	28
Pasa-ak	91
Pelmax	9
Picho	88
Pimientillo	55
Pino	62, 63, 64, 65, 66, 67, 68
Pino colorado	65
Pino ocote	68
Pino ponderosa	66
Pirinola	99
Popiste	11
Primavera	87
Pucté	14
Ramón	13
Rosadillo	54
Siricote	23
Tepehuaje	47
Trementino	109
Tzalam	48
Ya -axnik	105
Yayo	46
Zopo	36

List of Species by Belizean Name in Alphabetical Order

Name	Number on Botanical List
Banak	104
Barba Jolote	70
Bastard Mahogany	19
Billy Webb	95
Bitterwood	103
Black Cabbage Bark	44
Breadnut	13
Bullet Tree	14
Bullhoof, Female	6
Bustic	30
Cedar	21
Chechem	53
Cramantee	35
Fiddlewood	105
Granadillo	74
Hogplum	92
Hormiga	58
Ironwood	28
Mammee, Wild	5
Mahogany	96
Mahogany, Bastard	19
Monkey Apple	42
Morototo	29
Mylady	9
Nargusta	102
Negrito	91
Oak	81, 82, 86
Panama Rosewood	73,
Pine	62, 63, 64, 65, 66, 67, 68
Prickly Yellow	108
Provision Tree	59
Quamwood	88
Red Fowl	71
Red Gombolimbo	15
Rosewood	26
Salmwood	22
Samarapa	40
Santa Maria	17
Sapodilla	51
Southern Wild Mahogany	101
Tubroos	32
Waika Chewstick	97
Yemeri	106
Zacuayum	52
Ziricote	23