



TOGETHER
for a sustainable future

OCCASION

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



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

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

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

RESTRICTED

18402

DP/ID/SER.B/674
29 May 1990
ORIGINAL: ENGLISH

TIMBER PRESERVATION FOR CONSTRUCTION

SI/NIC/86/902

NICARAGUA

Terminal report*

Prepared for the Government of Nicaragua
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Don Lionel Jayanetti,
timber preservation specialist

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

United Nations Industrial Development Organization
Vienna

* This document has not been edited.

(ii)

CONTENTS

	Page No.
1. BACKGROUND	1
2. TERMS OF REFERENCE	4
3. CURRENT STATUS OF THE TIMBER PRESERVATION INDUSTRY IN NICARAGUA	5
4. WORK CARRIED OUT BY THE EXPERT	10
5. RECOMMENDATIONS	14
6. ANNEX I	16

1. BACKGROUND

Nicaragua has fairly abundant coniferous forests (Pinus Caribaea/Pinus Ocarpa) which is suitable for construction. In addition there are other species which could be used for construction as well as for transmission poles after treatment with preservatives.

For Nicaragua timber frame construction offers a solution that is relatively fast and low-cost, uses a natural renewable resource and can be earthquake resistant. Durability is a major consideration when using timber and it can be overcome by selection of naturally durable species (which tend to be expensive and suitable for higher value uses) or by preservative treatment.

UNIDO in its project UC/NIC/83/267 introduced its low-cost prefabricated modular wooden bridge system into the country in Region No. 1 and supplied workshop equipment which was installed in Ocotal. The Government's intention is to set up a satellite workshop in special Region No. 1 at Puerto Cabeza on the Atlantic Coast.

2.

Nicaragua plans to build several hundred bridges - a large proportion suitable for the UNIDO design. (See Table 1) It also

Table 1

NUMBER OF BRIDGES SUITABLE FOR THE UNIDO DESIGN (ESTIMATED BY MICONS)

SPAN IN METRES	AASHTO LOADING CLASS *	NUMBER
15	H15	5
	H20	3
	HS15	12
	HS20	14
18	H15	10
	H20	18
	HS15	20
	HS20	32
21	H15	4
	H20	5
	HS15	36
	HS20	18

places great emphasis on reconstruction of the housing stock. Also timber is an important building material in the construction of schools, clinics and other social buildings which are urgently needed. Hence preservation of constructional timber can play a major role in this area of development.

3.

Nobile treatment plant was supplied by UNIDO to the Modular Wooden Bridge Project but this has not been installed yet. This plant is mainly intended for treatment of timber components for bridge building. However, it could be used to treat other timber components.

There is another treatment plant operated under CORFOP (CORPORACION FORESTAL DE PUEBLO) which needed urgent repairs and training for treating timber efficiently.

Therefore this project was intended to provide sorely needed specialised expertise to rehabilitate the plant and carry out the required training.

4.

2. **TERMS OF REFERENCE**

The purpose of the project was to improve facilities in Nicaragua for preservative treatment of timber for construction uses by pressure impregnation.

The expert was required to work with counterpart staff of the Peoples Forestry Corporation - CORFOP under the Ministry of Construction to repair and make functional the treatment plant under its responsibility and in particular to:

1. Check all the parts ordered by UNIDO on the advice of the expert.
2. Install the new parts and test that all circuits and control systems work properly.
3. Train counterpart staff in all aspects of repair, maintenance and operation of the treatment plant.
4. Prepare operating instructions and advise on suitable treatment specifications for the main timber species used in construction.
5. Prepare a report summarising his activities covering the above points.

2. CURRENT STATUS OF THE TIMBER PRESERVATION INDUSTRY IN NICARAGUA

Though timber preservation is not new to Nicaragua, it has been practised only for treating transmission poles and prophylactic treatment (mainly fungicides) in the saw-milling industry. Even these have not been carried out continuously due to non availability of preservative chemicals and spare parts for existing treatment plants which depend on scarce foreign exchange.

As mentioned earlier, the key to building with timber is to make appropriate provision for durability - mainly by preservative treatment, at present only dipping, spraying and brushing of preservatives are being carried out in some instances. This treatment being superficial is of little use specially in the case of exterior situations.

Pressure impregnation has been focussed on the treatment of transmission poles using water-borne salts (mainly CCA - Copper/Chrome/Arsenic salts). The estimate for the annual requirement for treated poles is around 8000 which does not account for the replacement of a large number of existing poles.

6.

In 1989, more than 50% of this amount was imported from Honduras using valuable foreign exchange. In addition, firm requests have been made to supply treated poles to Colombia, Panama and Carribean countries. It is also understood that there are other species which could be used for both transmission poles and construction timber. These species have not been used due to non availability of their technical information. These include treatability characteristics and of course the treatment facilities are not available if the species are identified as needing treatment before use.

Pressure Treatment Plant at San Benito

San Benito plant which is operated by MADSA (Maderas Internacionales S.A.) a part of CORFOP and was installed in 1978 in Sanbonita about 50 km from the capital, Managua. This plant is installed in a site with an area of more than 3 hectares of land with storage facilities and office spaces. The plant was supplied by Koppers Company in USA with some of the components manufactured by Nicholls Machinery Company (in USA). It is 60 feet long and 6 feet in diameter.

Ascu Mobile Treatment Plant at Ocotal

A mobile pressure treatment plant 17 feet long and 2 feet in diameter (Model ASCU 2017) manufactured by ASCU India Ltd was supplied by UNIDO for the Modular Wooden Bridge Project. Unfortunately it is still in 'crates' to be installed and commissioned by the ASCU Engineer. This plant is intended for treatment of bridge components. It is understood that an ASCU Engineer will be travelling in early 1990 to carry out the installation.

Broken triangular timber components of the 18M modular wooden bridge constructed by the MICONs staff were inspected and it appeared that the failure was due to the lateral pins of the top chord not being welded properly. Quality of welding in other components was found to be very poor.

Wood Technology Laboratory ("OLOF PALME")

The Wood Technology Laboratory in Managua (Laboratorio de Tecnologia de la Madera) - LTM is a part of Instituto Nicaraguense de Recursos Naturales y del Ambiente (IRENA). It is under the Ministry of Natural Resources and Environment.

8.

This Laboratory consists of two sections each of which has three units:

1. Wood Technology Section

- Anatomy of Wood
- Drying and Preservation
- Wood Chemistry

2. Wood Engineering Section

- Physical and Mechanical Properties
- Sawing and Wood Working
- Wood Engineering

At present, work is being carried out at LTM to increase the number of timber species available for construction by evaluating the technical properties of species not currently being used and recommending end uses. Also it is linking up with the industry to carry out relevant research and development work.

The Drying and Preservation unit which comes under the Wood Technology Section is carrying out research work in the following areas:

- Drying characteristics of local species
- Establishing drying schedules
- Air and kiln drying
- Treatment characteristics
- Field trials (graveyard tests)
- Laboratory trials (accelerated durability trials)
- Analysis of treated samples

The work being done by other units are not reported in this document.

4. WORK CARRIED OUT BY THE EXPERT

The expert during his first visit to the project identified the spare parts required for the pressure treatment plant at San Benito. The spare parts were ordered through UNIDO and the supply was delayed due to the trade embargo on Nicaragua by USA as some of the spare parts were available only in USA. In addition, the pumps for this type of plant are out of production as they have been replaced by modern pumps. Hence spare parts are no longer available.

In addition, books, standards relevant to timber preservation, safety clothing and chemicals and equipment required for analysis of treated timber were supplied to the project.

During the expert's second visit to the project, (November 1989) spare parts were fitted to the plant with additional assistance from the technicians from MADSA and the plant was running smoothly at the time of his departure.

However, it is advisable to have a replacement pressure pump as the present pump will need major repairs although not in the near future. It is understood that UNIDO tried to take action to supply a pump on the advice of the expert, but funds had lapsed.

The exterior of this plant has been maintained extremely well with apparently no corrosion. Several treatment runs were carried out with *Pinus oocarpa* and *Pinus caribaea* transmission poles. Treatment schedules were established for both species and recommendations have been made for other main species used for construction. These appear in the Instruction Manual prepared for this project.

Actual trials on the latter species were not carried out due to the non-availability of required large quantities of these species to be treated in 60' x 6' plant. However, the counterpart staff are now in a position after the training to carry out these trials on the procedures recommended by the consultant.

It was agreed that LTM - Wood Technology Laboratory could assist MADSA staff in this task.

Training Programme

A separate training course was conducted for 6 officers from MADSA and MICONS (Ministry of Construction). The list of officers attended is given in the Annex I. The two officers from MICONS are from the Bridge Building Programme in Ocotal and they are expected to operate the ASCU mobile treatment plant when it is commissioned.

The Training course consisted of theory and practicals.

Theory consisted of:

- Benefits of Timber Preservation
- Wood Structure
- Decay Hazards
- Wood Preservatives
- Drying and Preparation for Treatment
- Preservative Treatment Processes
- Health and Safety Aspects
- Record Keeping (including calculations)

Practical training continued throughout on the operation, calculations, keeping of records, testing for penetration, stacking of timber, drying aspects and routine maintenance. Health and Safety aspects of the whole operation at all stages were stressed.

Since the Sanbonita plant was concentrated on treating timber poles and is intended for export of poles, graded of timber poles according to ANSI.05-1-1979 (American National Standard Specifications and Dimensions for Wood Poles). This standard was explained and some poles were graded as an exercise.

A visit was made to the Wood Technology Laboratory - LTM and contact was established between MADSA and LTM so that LTM staff can assist MADSA in analysing treated samples and in assisting to establishing treatment schedules for other species.

Instruction Manual

A separate instruction manual was prepared for the San Benito plant which could be used for the ASCU plant at Ocotal with two major exceptions:

1. Though the procedure of pressure treatment is principally the same, actual operating instructions for the San Benito plant differ from the Ocotal plant as former is semi automatic, while the Ocotal plant is fully manual.
2. Routine maintenance is slightly different. However, it is understood that operating instructions and routine maintenance procedures are being supplied by ASCU India Ltd, for the Ocotal plant.

5. **RECOMMENDATIONS**

5.1 Specific recommendations for San Benito plant.

5.1.1 Stacking of timber at the plant site should be improved by:

- Cleaning the site of stacking
- Placing the timber elevated from the ground

5.1.2 Strength properties of the timber poles (Especially for export) should be determined preferably by structural size testing. A testing machine can be prefabricated and installed locally if a proper design is prepared. By having a testing machine, new species could be tested.

5.1.3 Close contact should be maintained between LTM and MADSA to:

- Check the quality of treatment
- Evaluate other species and to establish treatment schedules

5.2 Specific recommendations for Ocotal plant

5.2.1 Steps should be taken to expedite the installation and commissioning of the plant.

5.2.2 MICONS staff at Ocotal should get assistance from LTM - Wood Technology Laboratory in the selection, drying and preservation of timber for construction. They are in a position to assist in determining other characteristics such as physical and mechanical properties.

5.3 General recommendations

It is recommended that:

- A training workshop in drying and preservation should be carried out in Nicaragua (mainly for MICONS and CORFOP staff involved in timber utilisation).
- The Possibility of the use of diffusion treatment for interior timbers should be studied.

ANNEX I

LIST OF PARTICIPANTS

FOR THE TRAINING COURSE

	<u>NAME</u>	<u>ORGANISATION</u>
1.	Leslie E Coe	MADSA
2.	Oscar Escobar	MADSA
3.	Mauricio Latino	MADSA
4.	Jose Montes	MADSA
5.	Nelson Campos	MICONS
6.	Freddy Gutierrez	MICONS

No. 1 and No. 2 were with the expert throughout his work in Nicaragua.