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DA and DC/HON/81/002
Contract No. 82/75

14939-E

WOODEN BRIDGE BUILDING - HONDURAS

Honduras.

FINAL REPORT FOR A CONTRACT

CONCERNING THE

DEVELOPMENT OF PREFABRICATED WOODEN BRIDGES.

FEBRUARY 1985

TIMBER RESEARCH AND DEVELOPMENT ASSOCIATION,

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U.K.

4005

Under contract from the
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

DEVELOPMENT OF PREFABRICATED WOODEN BRIDGES

INTRODUCTION

In 1980 the government of Honduras requested a technical assistance mission in the wood industry sector with the object of preparing a project document for the development of a system of prefabricated modular wooden bridges, and a project document for wood sector assistance plans in the period 1982 - 1986. The intention of the former was to plan an extensive bridge building programme to improve secondary and rural access roads for the benefit of rural development.

A preparatory UNIDO mission was executed in January, 1981, (report reference: DP/ID/SER.A/285) and as a result a small demonstration project was commenced in March 1981 (report reference: ID/SER.A/307). Following a request from PAC in August 1981, TRADA was contracted to continue the development of the prefabricated modular wooden bridges. A final report for this phase was submitted on 20 May, 1983, (reference: T81/61/DG).

An important output of this phase was the construction of a 12 m four-truss prototype bridge, in the town of Yuscarán, which is in the Department of El Paraíso. The relatively low cost of timber bridges of this type, carrying properly specified highway loadings and constructed entirely of local timber, with much local labour input in construction of bases and other civil works, proved that the system was economically attractive in Honduras.

In May 1982 the southern zone of Honduras, principally in the Department of Choluteca, was seriously affected by floods, following a tropical storm. This gave rise to a request for further assistance, to rebuild the infrastructure of this agricultural zone of the country. The resulting projects were DA and DC/HON/81/002, and UNIDO contract to TRADA No. 82/75.

A UNIDO-appointed resident engineer, J. C. Cano, had joined the Honduras bridges projects towards the end of the first phase, and was given terms of reference which included using the experience gained during the project involving the bridge at Yuscarán, to advise in setting up a bridges section in SECOPT, the relevant government ministry of public works and transport. A manufacturing workshop was to be set up, and personnel trained to produce continuously the modules and components needed for further prefabricated bridges. There was also considerable emphasis in the terms of reference for the resident engineer, on the preparation and organization of site work, since at that stage, this was a cause of difficulty in the implementation of the system.

TRADA's terms of reference, given in full in Annex I, were to assume overall engineering responsibility and undertake general direction of the resident engineer, and to affect a number of modifications and developments of the system. Both types of activity were carried out by TRADA, and in total six visits were made by the consultant's personnel.

In addition, somewhat more effort than was originally anticipated was required in the specification and design of equipment and in advising over its supply. Also, another sub-contract, reference U83/281, was awarded to TRADA to produce a series of manuals covering the bridge system in full, which would be applicable in any country requesting assistance. There was considerable input from experience gained in the specifically Honduran project, which was also used to improve the contents of these manuals.

Projects DA and DC/HON/81/002 officially terminated, after several extensions which enabled the resident engineer to remain or return, on 31 October 1984. This final report of TRADA's subcontract 82/75 sums up the project to that date. Recommendations have been given for new projects, enabling the prefabricated wooden bridges effort to continue in Honduras. These consist of a contract to TRADA from the Overseas Development Administration of the British Government, and a Special Industrial Services agreement, UF/HON/84/177, drawn up by UNIDO to permit further services of the resident engineer.

Progress of the project has been amply described by means of interim reports from TRADA, Tripartite Review Meeting minutes, and 'Notes To The File'. This report attemps therefore to give an overview of the major activities carried out and the outputs produced. Greater detail is given of the findings and recommendations of a final visit, made from 21-27 October 1984, whose objective was to agree the final situation with all parties concerned in the field, and to make arrangements for the continuation projects.

OBJECTIVES OF THE PROJECT

Long-term

1. To assist the government in its plans to improve the national road network, with special reference to rural zones, achieving this as much as possible by use of local materials and labour.

2. To augment employment opportunities, both in a bridge workshop, and in the rural areas where the bridges were planned.

Immediate

1. To satisfy a requirement for bridges of 9 to 27 metres span, fitting the national plan, the intention being to concentrate effort in Choluteca District where storm damage gave rise to an emergency rehabilitation effort.

2. To incorporate information on national forest resources into recommendations fitting the strength grouping scheme adopted, and other methods for classification of technological properties which have been found appropriate.

3. In conjunction with contract U83/281, to revise the design, construction and launching information given in the Kenya manual and incorporate information in new manuals and drawings appropriate for Honduras and elsewhere.

4. To advise and assist in the development of sites for the bridges, co-ordinating local knowledge of stone and concrete construction for bases with local civil engineering experience and the needs of the system.

5. To develop a suitable workshop for modular panel manufacture and advise and assist in overcoming problems of installation of jigs, equipment and machinery.

6. To provide follow-up recommendations.

RESULTS OF THE PROJECT

1. A total of ten bridges had been completed by the official termination date. These bridges are in use on the national road network. They are all in rural areas, where community and agricultural communications have been improved and an estimated 300 000 total of population has been integrated by the project.

2. A complete workshop has been set up, which is continuing to run. This incorporates a new storage structure, and a new workshop layout, themselves constituting important training items. More equipment than originally anticipated has been provided by the project, and TRADA has given advice on the specification and procurement of this equipment.

3. A special Wooden Bridge Section has been set up by the relevant government department, SECOPT. The Chief Counterpart and several of the engineers involved have served alongside the experts throughout the entire project and its extensions. An experienced launching team and workshop staff now exist. Good stock records have been kept, and a cost control system has been instigated.

4. The following technical inputs and improvements have been made to the UNIDO bridge system in general (all relevant to multiplier effects in other potential beneficiary countries):-

(i) Detailed improvements in the modular panel; rationalisation of the steel chord designs; more precise specification of bracing and other construction details.

(ii) Experience in launching and construction, previously lost through cessation of the Kenya project, has been regained and fully documented. Construction of a substantial number of bridges all in one country by the same team has made it possible to firm up on all of these techniques and leave written and drawn records. Information on the launching forces has been revised and incorporated into the international manuals. Principles for launching multiple spans have been written up and drawn, but not yet practised.

(iii) Anomalies in the design tables given in the Kenya manual have been resolved, and corrected tables provided in the new manuals.

(iv) Design alternatives have been considered. Those agreed in the original terms of reference and contractor's proposal between UNIDO and TRADA were:

a. Timber tension chords
b. Timber abutments
c. Plywood gussets for modular panels
d. Cable members for tension chords

Items a. and b. were investigated, recommended to be of value and fully designed and drawn up. Three full-sized timber tension chords were prototype tested, and light and heavy chord design alternatives were produced. Since the contract officially terminated, light timber tension chords have been incorporated in a 15 m, four-truss bridge in Choluteca District, under the auspices of the ODA contract to TRADA.

Item c. was investigated, but neither recommended nor pursued in detail. Item d. was investigated, a brief technical report presented, and the technique held in reserve for appropriate situations.

(v) A testing rig has been designed to load each modular panel after manufacture, as part of a quality assurance programme for bridge workshops. Assistance has been provided in the procurement of hydraulic equipment for this, and progress in the manufacture and installation of the rig has been monitored. Training in other aspects of quality control, such as timber stress grading, has been by means of attendance by Honduran nationals at a regional course in timber structures, and at workshop level by informal instruction.

SITUATION ON FINAL VISIT

A final visit was made from 21 to 27 October 1984, to agree the situation in the field at that date, and to make arrangements for the continuation projects. The following was the situation:

1. Overall guidance and advice on equipment

The overall engineering responsibility that has been taken by TRADA and the guidance provided both directly through visits, and by means of information provided to the resident engineer, has been an important factor in the successful completion of ten bridges in the country. A list of these bridges is given in Annex II, which also includes future bridges planned by SECOPT, which are discussed below.

A complete workshop and wooden bridge department has been set up by SECOPT, with the project's assistance, and this is continuing to run with less direct support, for example during the resident engineer's recent absences on other UNIDO projects. The Chief Government Counterpart, Sra. de Cuadra, continues to run the department, and several other personnel are serving who have been with the project from the beginning. For example, the engineer Ismael Gutierrez is using the recommended method of planning cut-and-fill and abutment elevations, and is competent in the design of the bases.

Detailed design improvements recommended by TRADA, such as changes in the top chords of the modular panels, are fully incorporated in the routine of production.

2. Workshop

All the equipment which has been installed is in use in the manufacture of panels, mainly of the light chord type. Panels continue to be made principally when specific bridge sites are nearing completion, and occasionally for stock, but the workshop has potentially a far greater capacity. A figure of three bridges per month has been stated as desirable by the minister responsible, and this would easily be achievable with the equipment provided. At present there are sufficient steel plates in stock to continue manufacture for a while, but difficulties with shortage of these is forseen. The ODA contract with TRADA includes provision of further steel, but in the longer run, major aid funding is required for this, amongst other items, since there are no prospects of steel manufacture within the country.

The Dankaert long-table surface planer, supplied from Wilkinsons, London, is in use for preparation of panel members. Its principal purpose was intended to be to obtain one straight edge on each piece, as a datum for subsequent widthing. However it is also useful for working a face of cupped pieces, and taking out slight bow, since the original thicknesser was not purchased in accordance with the recommendations, and lacks power for the large pieces of wood used for the modular panels. The use of planed timber has cosiderably inproved the straightness and reliability of the bridge girders assembled from these new modular panels. The correct practice of drying and cutting timber members to include all cross-cuts and drillings before pressure treatment has now been adopted.

The steel jig tables have also been finished, and are in use for the manufacture of panels. They are an improvement on the old wooden jigs which were showing signs of wear, and becoming liable to cause inaccurate panels.

3. Testing rig

A steel portal frame, in accordance with a new TRADA design, has been physically installed by SECOPT staff. At the time reported, further work was required, as follows:

A small crane, based on a light duty chain hoist, should be provided to lift the panels to and from the testing rig. The electricity in the main workshop building should be run out to the lean-to where the rig is installed, and fuse and switch boxes fitted. The hydraulic pump and controls will then require to be installed, and expert advice will be necessary to ensure that this is carried out successfully.

Subsequently, the rig will require calibration, and to help the experts and local staff perform this operation, a request for assistance in the form of a technician and a proving ring has been agreed by the Civil Engineering Department, UNAH.

4. Wood chord bridges

Drawings of the finalized TRADA designs for light chord and heavy chord lower wooden chords have been made available to the project. In these designs, it was considered necessary to retain the principles of connexion between the lower chords and the lateral pins on the lower panel plates, since to do otherwise would have involved radical changes to the whole bridge design. For this reason, several fairly complicated steel pieces were needed to effect these end connexions on the wood chords. Thus, the actual saving in raw material costs through use of wood chords in place of the all-steel design is not great. However, there are other cost-saving considerations. For example, initial enquiries have been made into the possibility of shipping fresh sets of steel parts to Honduras, as part of a new ODA-sponsored aid package. In this case, the avoidance of the need to freight steel flats of about 3 metres in length results in a considerable saving. Furthermore, in future bridge projects, the flexibility of choice of stock resulting from the fact that the steel parts for the wooden chords are individually much smaller, should be an advantage.

The use of correctly graded timber for the tension chords may in addition lead to a safer bridge in cases where correct steel lengths are not available, and reliance would otherwise be upon splice-welded steel tension chords whose quality and durability in stress corrosion situations might be questionable.

It is planned to use the stock in hand for modules for the Santa Rosa, Choluteca bridge, a 15 metre four-truss light chord design. This is expected to be the next site ready for launching. Metal plates in accordance with the TRADA wood chord details, have been made in Honduras, to a satisfactory standard of manufacture. The timber, which is of a suitable quality for this more exacting application, has been delivered to the workshop. It requires drying, thicknessing and cross-cutting, and will subsequently be sent for pressure treatment. After this, it will be re-dried, and used to make wood chords. It is planned that the launch of th s

bridge will form part of the auxilliary video film footage to be taken by TRADA engineers prior to a visit to Honduras by the audio-visual expert.

The site at Santa Rosa, which was visited in its early stages of construction during the regional Costa Rica/Honduras training course in April 1984, is nearing completion. Substantial work, mainly by hand labour, is involved in completing the fill on the approach road to one of the abutments.

5. Wood-piled approach spans

Unfortunately there seems little prospect that the timber piled, wooden approach span design which was passed to the project after development by TRADA some considerable time ago, will be implemented in the near future. The districts in which bridges are being constructed are less suitable for this method than others that may be developed at a later date. For example, the District of Atlantida has aluvial soils, deeper slower running rivers, and includes towns such as Tela, where it is understood the railway company has used pile driving equipment.

Both TRADA and UNIDO remain keen to implement this type of design and it is hoped that during future projects it will be possible, first to evaluate existing equipment and investigate needs for new plant, then to proceed along the lines indicated by the drawings.

6. Multiple-span bridges

To complete the El Triunfo - Concepción de María road link in Choluteca District, and later to span many other crossings in other parts of the country, multiple-span bridges are required. It is considered that there is now sufficient experience in use of the modular wooden bridge system, and practice in launching, to make this feasible.

A report has been provided proposing a method for launching multiple-span bridges. The essence of the method is to provide support frames and anchorages such that the launch procedure for each individual span is identical to the wet crossing method for single spans. The support frames are made from tall poles and bolted cross pieces, with the frames stayed to the pier bases from specially cast-in anchorages. The proposed method obviously requires new equipment for the support frames but apart from that, equipment of the existing type may be used.

Before the method can be implemented, further consideration will be given to details of the tensioning methods, dimensions and fixings of the launching frames, and lists of equipment. In addition, there are some bridge design details requiring attention. These include design of pier caps and provisions for a suitable continuous deck over the intermediate piers.

A site known as El Papalon is in early stages of preparation for a double span of 15 metres, near the town of El Triunfo, in Choluteca District.

7. General prospects for continued bridge construction

In general, prospects for continued bridge construction in Honduras are good. There are sufficient steel parts, bolts and wood for several more bridges, and a contract is agreed for further pressure treated wood. Lack of full sets of fasteners is likely to be the next hold up in continuing the programme, followed by shortage of steel flats for lower chords. It is hoped that the ODA project from Britain will alleviate the former problem for a while, and that the use of wood chords will help in the latter case. A World Food Programme agreement exists until the end of 1985 which will continue to provide rations for 'mano de obra' in the preparation of sites.

Some launching equipment has been damaged, including winches which were sent back to the suppliers but still found to be unserviceable upon return. It is hoped to assist in this by providing new launching equipment as part of the U.K. aid package.

It is stressed that there remains the need for a major aid project in order for wooden bridges to have the impact desired by the Honduran government on development of road networks in rural areas. In addition, the system has recently been identified by SECOPT and CONSUPLANE as having potential for the improvement of secondary road communications in underdeveloped suburban areas. The UNIDO projects which have so far taken place, and the expected continuation through ODA and SSA, should be regarded as valuable pilot projects, whose lead should be taken up by schemes which can give longer-term follow up, and far greater input in terms of straightforward financial backing.

RECOMMENDATIONS FOR FURTHER WORK

TRADA - ODA Contract and SSA

As noted earlier, recommendations have been given for new projects, enabling the wooden bridges effort to continue in Honduras. These consist of a contract to TRADA from the Overseas Development Administration of the British Government, and a Special Industrial Services agreement for the resident engineer. Arrangements have been agreed between TRADA and the UNIDO substantive officer to coordinate future visits with other short term contracts involving the resident engineer.

The following are the terms of reference stated by ODA for the continued involvement of TRADA:

1. Continue to assume overall engineering design responsibility for and to provide general guidance to the resident engineer recruited by UNIDO in respect of implementation of the prefabricated modular wooden bridge project in Honduras, and to advise on the specifications for and purchase of steel parts and

equipment.

2. Put into operation the test rig which has been designed, and advise on the establishment of a routine testing programme fo the modular panels produced in the bridge workshop. (This programme should follow recognised quality control procedures, and early results should be monitored to ensure the programme is operating correctly).

3. Implement completed design modifications, including wooden tension chords, advise and assist on the use of timber pile approaches, investigating possible sites and availability of equipment, and advise on the refurbishment of civil engineering equipment and the procurement of replacement parts, if this is feasible.

4. Develop a new launching procedure, advise on a planned double span bridge and attend at and advise on its construction, provided the Government of Honduras is able to proceed with the roadworks, abutments and piers.

5. Advise as required on the purchase and commissioning of an appropriate pressure treatment plant to apply preservative to bridge timbers, with a view to such a plant being installed at the workshop.

6. Prepare two video training films, one a general management and/or government agency introduction to the concept of prefabricated modular wooden bridges; the other a step-by-step guide to manufacture and launching based on the completed manuals.

7. Organize, and participate in the teaching of, a practical one-week course in Honduras on basic aspects of timber engineering design and structural grading of timber, for approximately twelve Honduran engineers and technicians.

Further recommendations

As mentioned above, the ODA and SSA projects will only provide stop-gap support, and there is need for further major funding. Technical activities which should accompany a project which would aim to enlarge a bridge programme to meet the real needs of the country, would additionally be aimed at extending timber engineering activities to meet other social needs. Taking advantage of the existence of an easily adaptable and already drawn and documented UNIDO prefabricated wooden building system, suitable for rural non-domestic building needs such as health and community centres, training centres and classrooms, has been suggested as one of the new fields into which to develop.

Additionally, further projects should been aimed at meeting the following needs in bridging:

1. Multiple-spans

As mentioned previously, a site named El Papalón is being developed in the Department of Choluteca, but it is unrealistic to expect this to be ready for launching within the time scale of the ODA project (financial year ending March 31, 1985). Furthermore SECOPT will need help in implementing the details already drawn up by TRADA and new details to be provided for attachment of stays at the pier bases. Further launching equipment will be needed for multiple spans, and assistance will be required in its specification and purchase. Subsequently, two more multiple spans would complete the El Triunfo - Concepción de María loop road, and others are required such as a double 15 metre span at a site known as Concepción del Río Grande, Department of Francisco Morazán.

2. Calculations and design additions

Following further enquiries by TRADA of the TRRL, who produced in 1981 a report entitled 'The Kenyan low cost modular timber bridge', and after discussions with other UNIDO experts, it has been concluded that there is no fully satisfactory, documented design basis giving structural calculations for the bridge system. Although the modular wooden bridges have been shown to work, and are giving good service under regular traffic loads in Honduras, the lack of design backing gives rise to concern for several reasons. A rather negative one is that should problems arise in the future, then without calculations the whole system might be called into doubt, whereas reference to a condition in suitable calculations might show an acceptably unusual circumstance to have arisen. More positively, a new design basis would permit examination of cases where four trusses rather than six might be used (several such instances arise for important spans around 18 metres in the stress grade of timber used in Honduras). Furthermore it would enable proposals to be drawn up for the use of three girders for longer spans and/or heavier loadings, in place of the cumbersome arrangement of additional side trusses, which have proved slow, and on one occasion dangerous, to launch.

Calculations supplemented by tests would also lead to the investigation of extra-heavy duty panels and other modifications to the design, in situations where very heavy loads such as logging vehicles are requested. Initial studies of forces in individual panels, and discussions with those responsible for the earlier prototype tests, suggest that such a development of the system would be feasible.

3. Timber approach spans and other supports

Ten bridges are proposed by SECOPT in the Department of Atlántida. This is a district having sand and clay soils, needing piling. The drawings already produced, and the report on equipment that will be drawn up in the ODA project, will provide

a basis for development of such sites. Funding will be required to permit the presence as required, of a regional UNIDO engineer, and visits for advice on implementation by TRADA. Means will also have to be sought of acquiring the necessary equipment.

It is also considered likely that in districts where the terrain differs from those previously experienced, other abutment and pier types may be of value. These would include concrete and masonry types built over timber piled foundations, reinforced earth abutments, other timber constructions, and gabions.

4. Preservative treatment plant

Advice will have been provided on the purchase and commissioning of an appropriate pressure treatment plant for bridge timbers with a view to such a plant being installed at the workshop. It is understood that a request for a plant has been submitted by the government. Assuming it is possible to fulfil this request, training in use of the plant and correct processing of the timber, including additional quality control procedures, will be required. The services of an engineer from a company able to supply and install such equipment could be retained for a brief initial period. Thereafter, it is recommended that further training of local personnel and follow-up to ensure correct use should be provided by further cooperation between TRADA and the regional engineer. Additional collaboration with the Escuela Nacional de Ciencias Forestales, Siguatepeque, who have already agreed to participate in a forthcoming planned training course, may also be helpful in this respect.

C. J. Mettem, M. Tech., C. Eng., M.I.Mech.E

11 February 1985.

ANNEX I

Terms of reference

Prefabricated modular wooden bridges

These terms of reference are intended to form the basis of a contract with an Institute or Research and Development Association specialized in timber engineering. The objective of the project is to assist Honduras to rebuild ten bridges in the storm-damaged Choluteca District in the South. A resident engineer will be engaged by UNIDO to take charge of the bridge element production, site preparation and bridge launching.

(1) General Background Information

UNIDO developed a prefabricated, modular wooden bridge system in Kenya which can permit spans of up to 30 metres for AASHO (American Association of State Highway Officials) loadings of up to HS20 - i.e., 40 tonnes - depending on timber species used.

A 12 metre - 4 truss prototype bridge has been erected at Yuscaran and full instructions and specifications for the system have been prepared by the Timber Research and Development Association (TRADA) as part of Project DP/HON/81/002.

In May 1982, tropical storm 'Aletta' damaged a considerable part of the Choluteca District in the southern zone of Honduras - including roads and several bridges. This project will replace ten of these bridges and firmly establish the system in the country by strengthening the manufacturing facility through relocating and improving the existing workshop to the level of a small factory and training counterpart personnel of the newly formed Bridge Section of the Ministry of Public Works.

The rehabilitation effort is being coordinated by the National Agrarian Institute (INA) and the bridges provided by this project will

be built in coordination with other emergency relief programmes and loans to improve the roads and infrastructure of the area.

(2) Aim of the Project

The project is intended to replace damaged bridges on an emergency basis and also to consolidate the bridge system in the country by strengthening production, erection and technical design and costing functions within the Ministry of Public Works. It is, in effect, an extension of a current project DP/HON/81/002 whose aim was to create a small workshop and build a prototype bridge.

(3) Scope of Contracting Services

The contractor will:

(a) Assume overall engineering responsibility and undertake general direction of the resident engineer recruited by UNIDO regarding application of the bridge system;

(b) Effect certain modifications and developments of the system, viz -

i) design a system for launching of multi-span bridges,

ii) design suitable abutments using locally available timbers for piling and approaches,

iii) determine whether plywood can be used for gusset plates instead of steel,

iv) design timber tension chords to replace the current steel ones, and

v) determine the feasibility of using cables as tension members.

In all of the above, costs and implications with regard to practical application should be examined and reported;

(c) Assist in the launching of at least two bridges (one multi-span and the first of this project extension);

(d) Advise on quality assurance procedures to be followed and organize and carry out a training course (assisted by the resident engineer) in timber stress grading;

(e) Assist the resident engineer to develop and introduce a costing system for the production of the elements and erection of the bridges.

ANNEX II

List of bridges completed and under construction

SIECT - SECOPT
HONDURAS
PROYECTO DA/DC/HON/81/002

RELACION DE PUENTES CONSTRUIDOS
Y EN PLENO FUNCIONAMIENTO

FECHA: 31/10/84

NOMBRE	LUGAR	LUZ (MTS)	TIPO Y CAPACIDAD DE CARGA	FECHA DE TERMINACION
1. YUSCARAN	EL PARAISO	12	L/H20/ 20 TM	OCT. '82
2. SAN JUAN YUSGUARE	EL CORPUS, CHOLUTECA	12	L/H20/ 20 TM	FEB. '83
3. NAICUPA	DULCE NOMBRE COPAN	18	L/H20/ 20 TM	JUNIO '83
4. AGALTECA	CEDROS, FCO. MORAZAN	21	P/HS-20/36TM	NOV. '83
5. EL ROSARIO	COMAYAGUA	6	L/HS-20/36TM	DIC. '83
6. LAS GRANADAS	CONCEPCION DE MARIA CHOLUTECA	18	L/H20/20 TM	DIC. '83
7. EL TULE	CONCEPCION DE MARIA CHOLUTECA	15	L/H20/20 TM	ENE. '84
8. LOS REMEDIOS	CONCEPCION DE MARIA CHOLUTECA	12	L/H20/20 TM	ABR. '84
9. QUEBRADA HONDA	SAN LUCAS, EL PARAISO	12	L/H20/20 TM	JUN. '84
10. SINGUIZAPA	CEDROS, FCO. MORAZAN	15	L/HS-20/36 TM	AGO. '84

RELACION DE LOS PROXIMOS PUENTES — FECHA: 31 OCT. 198-

NOMBRE	LUZ MTS	POR FINANCIAR: MADERA	POR FINANCIAR: PILOTES	PLACAS	CEMENTO BOL.
1. SANTA ROSA	15	OK	OK	OK	OK
2. SACAMIL	21	OK	OK	OK	OK
3. JUAN GIL	18	OK	OK	OK	OK
4. YAUYUPE	24	20,000	F	F	OK
5. COL. 21 FEBRERO	12	6,000	F	F	250
6. SAN LUIS COMAYAGUA	15	7,500	F	F	250
7. SAN MATIAS	12	6,000	F	F	500
8. CONCEPCION RIO GRANDE	2/15	15,000	F	F	1500
9. TATUMBLA	12	6,000	F	F	500
T O T A L		..60,000 P.T.	7 PUENTES		3,000

ONUDI - SECOPT
HONDURAS
PROYECTO DA/DC/HON/81/002

RELACION DE PUENTES EN EJECUCION

FECHA: 31/X/84

NOMBRE	LUGAR	LUZ (MTS)	TIPO Y CAPACIDAD	ESTADO
1. YAUYUPE	EL PARAISO	24	L/H20/20 TM	Listo para montaje
2. SANTA ROSA	EL TRIUNFO	15	L/H20/20 TM	Listo para montaje
3. SACAMIL	PESPIRE, CHOLUTECA	21	L/H20/20 TM	Listo para montaje
4. JUAN GILL	SAN FCO. YOJOA, CORTES	18	L/HS-20/36 TM	Listo para montaje
5. COL. 21 DE FEBRERO	FCO. MORAZAN	12	L/H20/20 TM	Bases en Construcción
6. SAN LUIS COMAYAGUA	FCO. MORAZAN	15	L/H20/20 TM	Bases en Construcción
7. SAN MATIAS	FCO. MORAZAN	12	L/H20/ 20 TM	Bases en Construcción
8. CONCEPCION DE RIO GRANDE	FCO. MORAZAN	2/15	L/H20/ 20 TM	Doble Luz, Bases en construcción
9. TATUMBLA	FCO. MORAZAN	12	L/H20/20 TM	Levant. Topográfico Inicio de bases
10. MONTE GRUESO # 3	SANTA BARBARA	9	L/H20/20 TM	Levant. Topográfico Inicio de bases
11. QUEBRADA SECA	DEPTO. ATLANTIDA	12	L/HS-20/36 TM	Levant. Topográfico Inicio de bases
12. EL ZACATE	DEPTO. ATLANTIDA	21	L/HS-20/36 TM	Levant. Topográfico Inicio de bases
13 GUACAMAYO	DEPTO. ATLANTIDA	18	L/HS-20/36 TM	Levant. Topográfico Inicio de bases.
14. LOS MANGOS	DEPTO. ATLANTIDA	21	L/HS-20/36 TM	Levant. Topográfico Inicio de bases
15. FITAL	DEPTO. ATLANTIDA	18	L/HS-20/36 TM	Levant. Topográfico Inicio de bases
16. EL VIOLIN	DEPTO. ATLANTIDA	21	L/HS-20/23 TM	Levant. Topográfico Inicio bases