OCCASION

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

DISCLAIMER

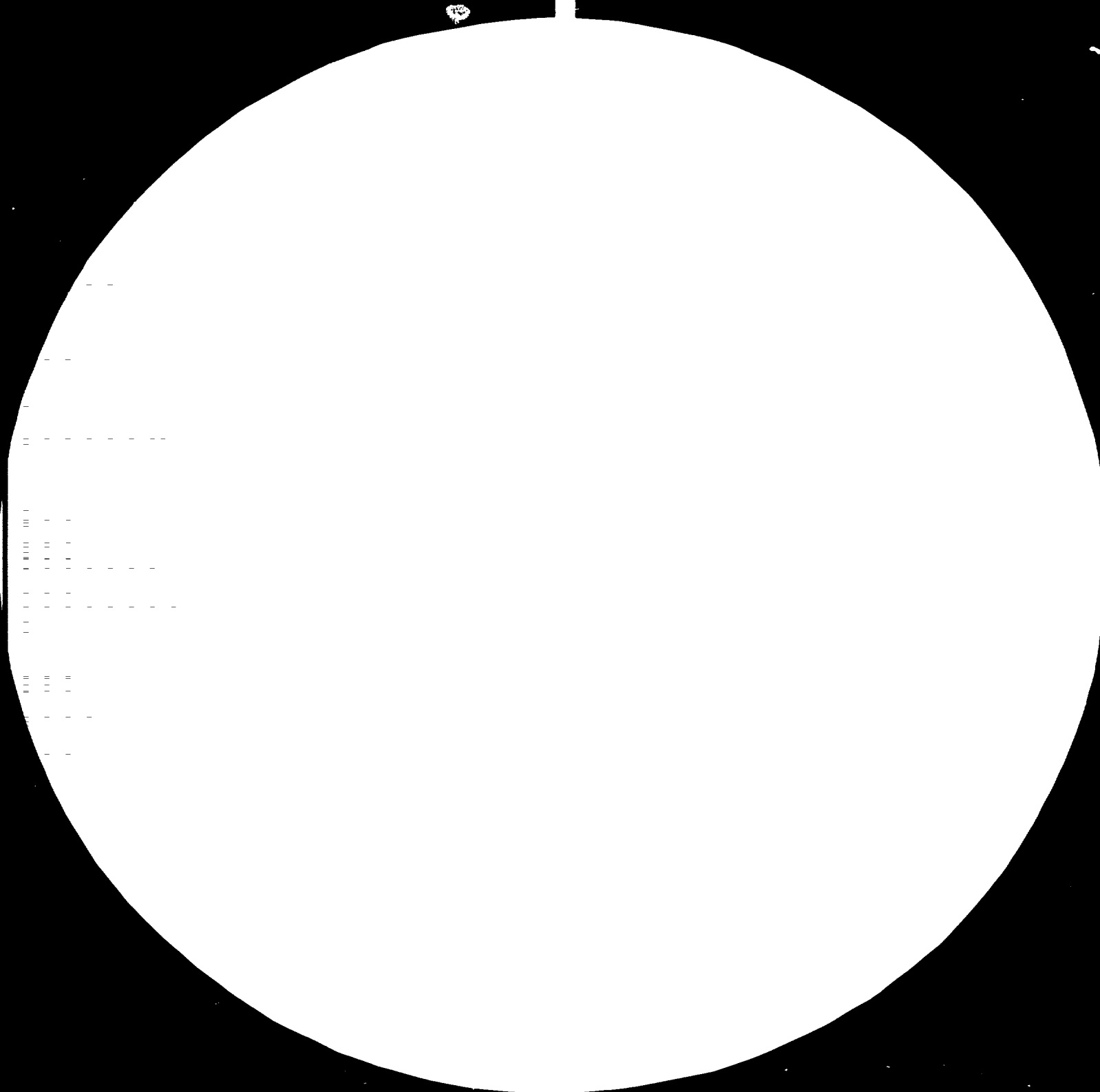
FAIR USE POLICY

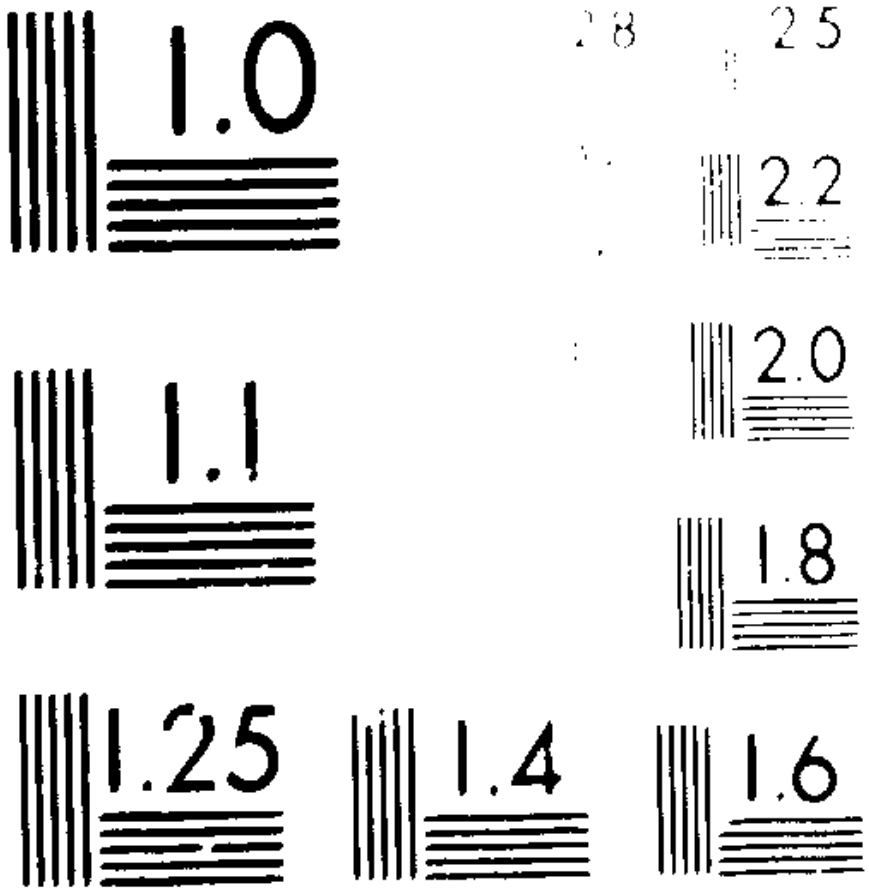
CONTACT

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

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

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




2.8
2.5
1.0
2.2
2.0
1.1
1.8
1.25
1.4
1.6

Distr.
RESTRICTED

UNIDO/IO/R.11

13 April 1982

ENGLISH

UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION

11544

Seychelles.

ESTABLISHMENT OF A NEW BOATYARD, BOAT MAINTENANCE COMPLEX ON THE ISLAND OF PRASLIN*

UF/SEY/80/044

SEYCHELLES

Technical report*

Prepared for the Government of Seychelles by the
United Nations Industrial Development Organization

Based on the work of B.K. Mazurkiewicz, expert
in yard and slipway design

* This report has been reproduced without formal editing

V.82-24491

TABLE OF CONTENTS

I. INTRODUCTION

The mission to the Republic of Seychelles was arranged according to the agreement between the Government of the Republic of Seychelles and United Nations Industrial Development Organisation concerning the establishing of a new Boatyard, Boat Maintenance Complex on the island Praslin. The basic document during the mission has been the Job Description UF/SEY/80/044/11-02/31.9.D which listed all duties connected with the position of the Expert in Yard and Slipway Design.

The mission period combines the briefing and debriefing at UNIDO in Vienna and the stay on Mahe and Praslin, Seychelles. The following periods have been followed:

Briefing in Vienna together with travel from Gdynia, Poland to Vienna, Austria and Victoria, Mahe - Seychelles: 24th January to 29th January 1982.

Stay on Mahe and Praslin, Seychelles: 29th January to ... February 1982.

Debriefing in Vienna together with travel from Victoria, Mahe, Seychelles to Vienna, Austria and Gdynia, Poland: ... February 1982.

The results of the mission are generally described in chapter II and presented in the following annexes:

Annex I: BOATYARD AND BOAT MAINTENANCE COMPLEX PRASLIN - GENERAL PROGRAM AND BASIC LAYOUTS.

Annex II: BOATYARD AND BOAT MAINTENANCE COMPLEX, PRASLIN. TIME SCHEDULE.

Annex III: PROPOSALS CONCERNING THE REALISATION OF THE PROJECT ACTIVITIES OF UNIDO AT THE ERECTION OF THE BOATYARD AND MAINTENANCE COMPLEX ON THE ISLAND PRASLIN SEYCHELLES

Annex IV: BOATYARD AND BOAT MAINTENANCE COMPLEX, PRASLIN, SEYCHELLES, EXPERTS SERVICES TIME SCHEDULE.

It has to be mentioned that the above listed documents have been agreed with the appointed representatives of the Ministry of Planning and Development.

During the mission a review of the "FEASIBILITY STUDY OF A PORT AND RECLAMATION PROJECT SEYCHELLES. SHIP REPAIR FACILITY" has also been made. Critical remarks on this study has been handed over to the Ministry of Planning and Development representatives. Due to the fact that this subject is not directly connected with the boatyard and boat maintenance complex, Praslin, the copy of the above mentioned remarks is not attached to this report.

II. GENERAL DESCRIPTION OF THE OUTCOME OF THE MISSION

The mission was sponsored by the Ministry of Planning and Development with daily support of Mr Emmanuel Faure, Chief Economist and Mr Philippe Michaud, Senior Economist.

During the mission meetings were held with Minister for Planning and Development, Dr J D M Ferrari, Building Control Officer at this Ministry Mr G Dang Fang, Principal Secretary of Ministry of Transport and Civil Aviation Capt. J Ferrari, Harbour Master of the Victoria Harbour Capt. R R Morgan and the Representative of the Seychelles Peoples Progressive Front at Praslin Mr Armentale G Lesperance.

In addition a wide discussion on the fishing development programme on the Seychelles as well as on the necessary fishing boats dimensions was held with the representatives of a Norwegian Consulting Company NORPLAN, namely Mr J Petter Barlindhaug, director of the Company, and Mr Albert Myrseth, fishery planner.

The work during the mission contained in the first phase preparation of proposals for discussion of the general program of the boatyard and of the proper time schedules. Before the approval of the above proposition a visit on island Praslin was organised during which the selection of the building site was made. In addition meetings have been held with the representatives of the Survey Division of the Republic of Seychelles during which the tide levels at the Baie Ste. Anne, Praslin has been estimated giving the possibility to recognise the necessary depth of the slipway end. The contacts with the representatives of the Survey Division allowed also to establish the planes of the parcels which have to be considered as the building site of the boatyard and boat maintenance complex in consideration. All the above data have been introduced in the general program and basic layouts of the boatyard enclosed hereto as Annex I.

The list of proposed equipment was discussed with a potential deliverer, namely Mr Mario La Polla, Manager of Societe Nautique Seychelles (Pty) Ltd. His comments concerning the types of equipment available and under service on the Seychelles were very appreciated.

The design works of the boatbuilding and repair hall, as well as the design of the slipway will be performed by the local design office. The basic assumptions and main input datas have been agreed in details with Mr G Dang Fang, who will supervise these works. The final discussions and approval of the designs will be made by the expert during the next visit at the Seychelles, which is planned to be at the end of April (see Annex IV). It has to be mentioned that the drawings of the part of equipment mentioned in Annex II point 6, will be prepared by the expert.

The approval discussions of the above-mentioned proposals have indicated that it is necessary to create adequate conditions for the construction of the boatyard as soon as possible. It was decided to propose to change the realisation program of the project activities of UNIDO and thus the Annex 3 has been prepared which contain the proposals of the Government of Seychelles in this field.

According to the above proposals a one year training of the production engineer of the new yard is foreseen. During the visit on the island Praslin the local boatyards have been visited showing that a high ability for such a training and for the foreseen position at the new yard may has Mr Rodney Pouponneau, recently a boatdesigner and boat-builder at his own boatyard. His candidature was also recommended by Mr A G Lesperance, the Representative of SPPF at the island Praslin.

Finally after all discussions, visits, design work four documents have been prepared being the annexes to this report. They are listed in Chapter I. It should be mentioned that the four documents have to be treated in common, it means, that the establishment in the proposed time of the new boatyard and boatmaintenance complex at the island Praslin, may take place only under such conditions that all proposals presented will be thoroughly fulfilled. This concern not only to keep the time of the purchase of the parcel for the building site, but also to finalise the financial problems as well as training possibilities. The proposed time periods are considerably short and therefore a strict fulfillment of the proposed datas is highly necessary.

ANNEX I

BOATYARD AND BOAT MAINTENANCE COMPLEX PRASLIN, SEYCHELLES

GENERAL PROGRAM AND BASIC LAYOUTS

1. PURPOSE OF THE BOATYARD:

Building and maintenance of wooden fishing boats.

2. OUTPUT OF THE SHIPYARD:

Building of 15 fishing boats 12 m long yearly or equivalent.

Maintenance and repair of the built boats in amount equal to yearly production.

3. TYPE AND DIMENSIONS OF BOATS TO BE BUILT AND MAINTAINED

Following two groups of boats are taken into consideration namely: pot fishing boats/handliners and shallow draft handliners/trollers (main production). The preliminary dimensions of the boats taken into consideration are as follows:

3.1 Pot fishing boat/handliner

Length over all	:	6.30 M (20 FT 8 IN)
Beam over all	:	2.30 M (7 FT 6 IN)
Length at D.W.L	:	5.80 M (19 FT 0 IN)
Draft to D.W.L	:	0.61 M (2 FT 0 IN)

3.2 Shallow draft handliner/troller

Length over all	:	11.70 M (38 FT 4 IN)
Beam over all	:	3.73 M (12 FT 3 IN)
Length at D.W.L	:	10.50 M (37 FT 5 IN)
Draft to D.W.L.	:	0.81 M (2 FT 8 IN)

4. LENGTH OF THE PRODUCTION LINE AND OF THE BOATBUILDING AND REPAIR HALL

It is assumed that the axis distance between the structural supports of the hall structure in the longitudinal direction, will be 6.0 m. Taking into consideration the in point 3 defined dimensions of boats as well as the above axes distance it is proposed to build a hall of length between axes of outer supports equal to 7 x 6.0 = 42.0 m. Thus the total production line for a support width of 0.3 m and the outside wall thickness of 0.15 m may have a total length of 42.0 m. Assuming that the space between ships under repair or construction should be at least 2.0 m in the longitudinal direction, and that the space between the ship and the face of the hall structure should be 1.2 m, the following number of boats may be simultaneously built or repaired:

Pot fishing boats	5	3	1	-
Shallow draft handliners/trollers	-	1	2	3
Total number of boats	5	4	3	3
Total length of production line, m	41.9	39.0	36.1	41.5

5. PROPOSED NUMBER OF EMPLOYEES

It is assumed that the number of employees may vary depending on the actual contracts. However, the basic group of persons which should be employed may be estimated as follows:

Position	Number	Necessary working space, m^2	Separate room necessary
General Manager	1	12	+
Deputy Manager (Production engineer, boat designer)	1	6	+
Draftsman for deputy manager	1	6	

Administration clerk	1	6	+
Financial clerk	1	6	
Secretary/typist	1	6	
Carpenter (boatbuilder) - master	1	20	+
Carpenters (boatbuilders)	10	200	
Painters - caulkers	2	30	
Sailmakers	2	30	
Mechanic - master	1	20	+
Mechanics - fitters	4	80	
Electrician	1	20	
Welders - caulkers - splicers	2	20	
Painter	1	20	
Tool and equipment storekeeper	1	-	in the store
Driver	1	-	not necessary
Total	32		

6. DIMENSIONS OF THE BUILDING AND REPAIR SHOPS

6.1 Carpenter shop

Length: 42.0 m

Width:

(a) Distance between the axis of the production line and between the hall structure face: 0.5 beam of the boat + 1.2 m = 0.5 x 3.73 + 1.2 m = 3.1 m.

(b) Total width of the boatbuilding or repair area = 2 x 3.1 m = 6.2 m.

(c) Total width of the carpenter working area 280m^2 (necessary area): 42.0 (length) = 6.7 m.

Distance between structural columns (preliminary height of a hall support cross-section = 0.6 m) = 6.2 + 6.7 + 2.03 = 13.5 m.

Total carpenter shop area = (6.2 + 6.7) x 42.0 = 542 m^2.

6.2 Mechanical Shop

Total necessary area: 160 m^2

Distance between the axis of the structural supports (proposed) = 9.0 m.

Total width of the mechanical shop = distance between the axes of the structural supports + the width of the structural support - width of the outside and inside walls = 9.0 + 0.1 - 0.3 = 8.8 m.

Total length = 160.0:8.8 = 18.0 m (three fields of 6 m).

6.3 Store for tools and equipment

An area of about 15% of the total production area of the hall (542 + 160 = 702 m^2) is assumed i.e. about 105 m^2.

Total length = 105.0 : 8.8 = 11.2 m (two fields of 6 m).

6.4 Assumed general dimensions

General dimensions of the boatbuilding and repair hall are presented on Fig. 1 and 2.

7. DIMENSIONS OF THE OFFICE AND REST ROOMS

7.1 Offices

Total necessary area: 42 m^2

Communication area: 10 m^2 (~10%)

Total area required: 52 m^2 (one field of 6 m).

7.2 Rest rooms

Total number of employees = 32

Necessary rest rooms area: 32 x 1.25 = 40m^2

Breakfast room: ~ 12m^2

Total area required: 52m^2 (one field of 6 m).

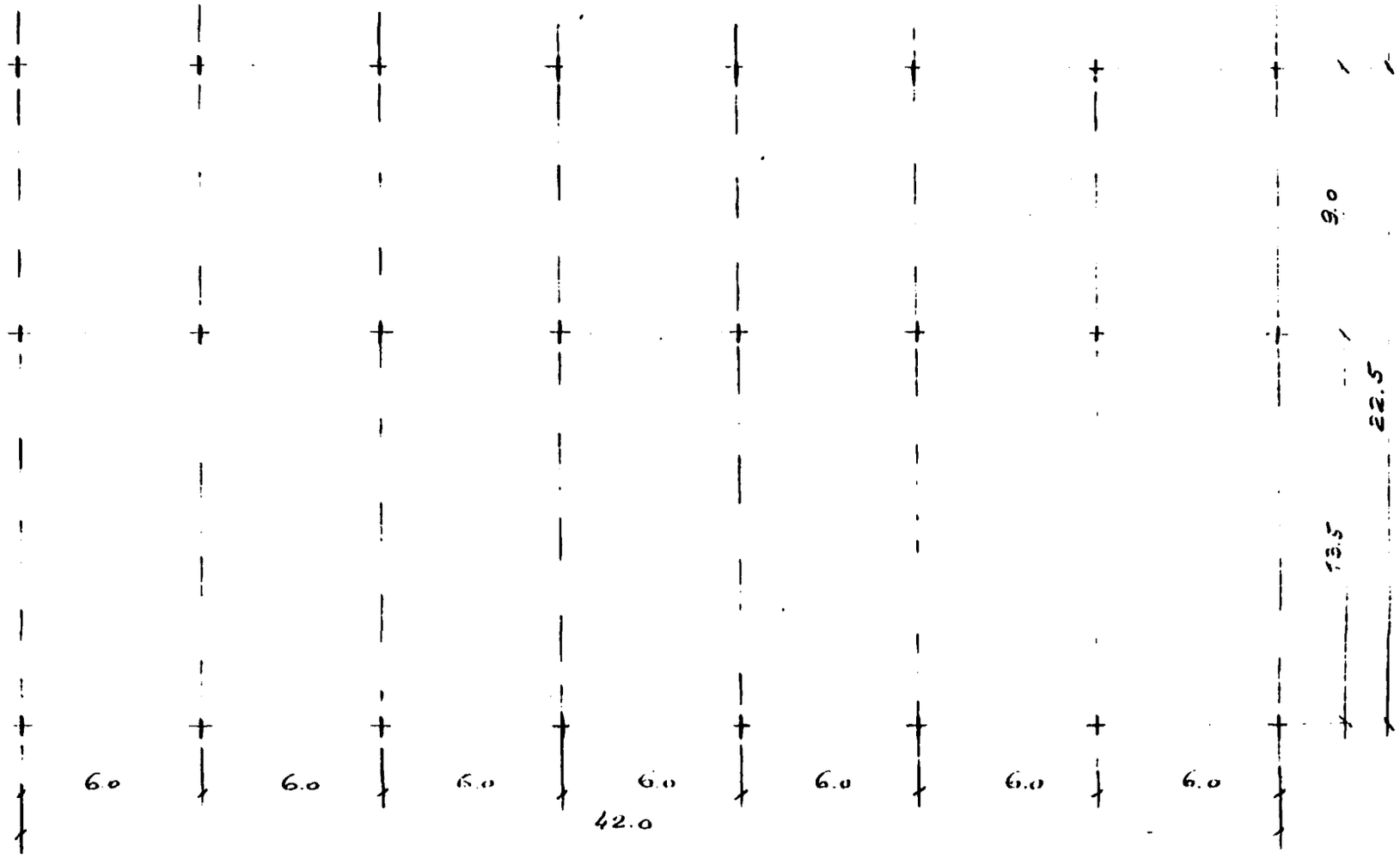


Fig. 1. Layout of supports of the boat building quay in the port

Remark: The assumed dimensions a, b, h may be freely changed, however under condition that the distance between the axes as well as the position of the walls will be kept.

Assumed dimensions.

wall thickness : 0.15 m = b

hall supports: 0.30 × 0.60 m = 2·h

0.30 × 0.50 m = 2·h

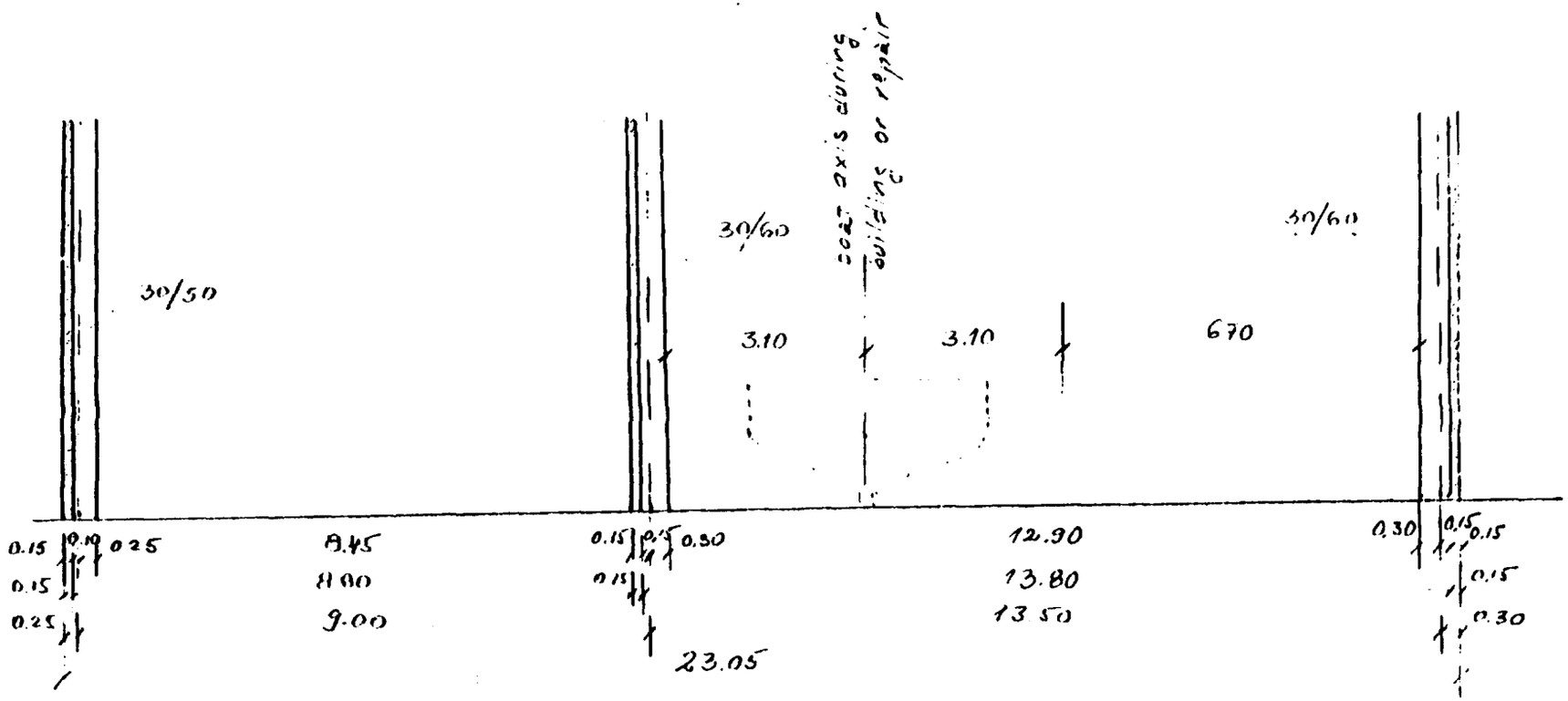


Fig. 2. Assumed overall dimensions of the hall cross section

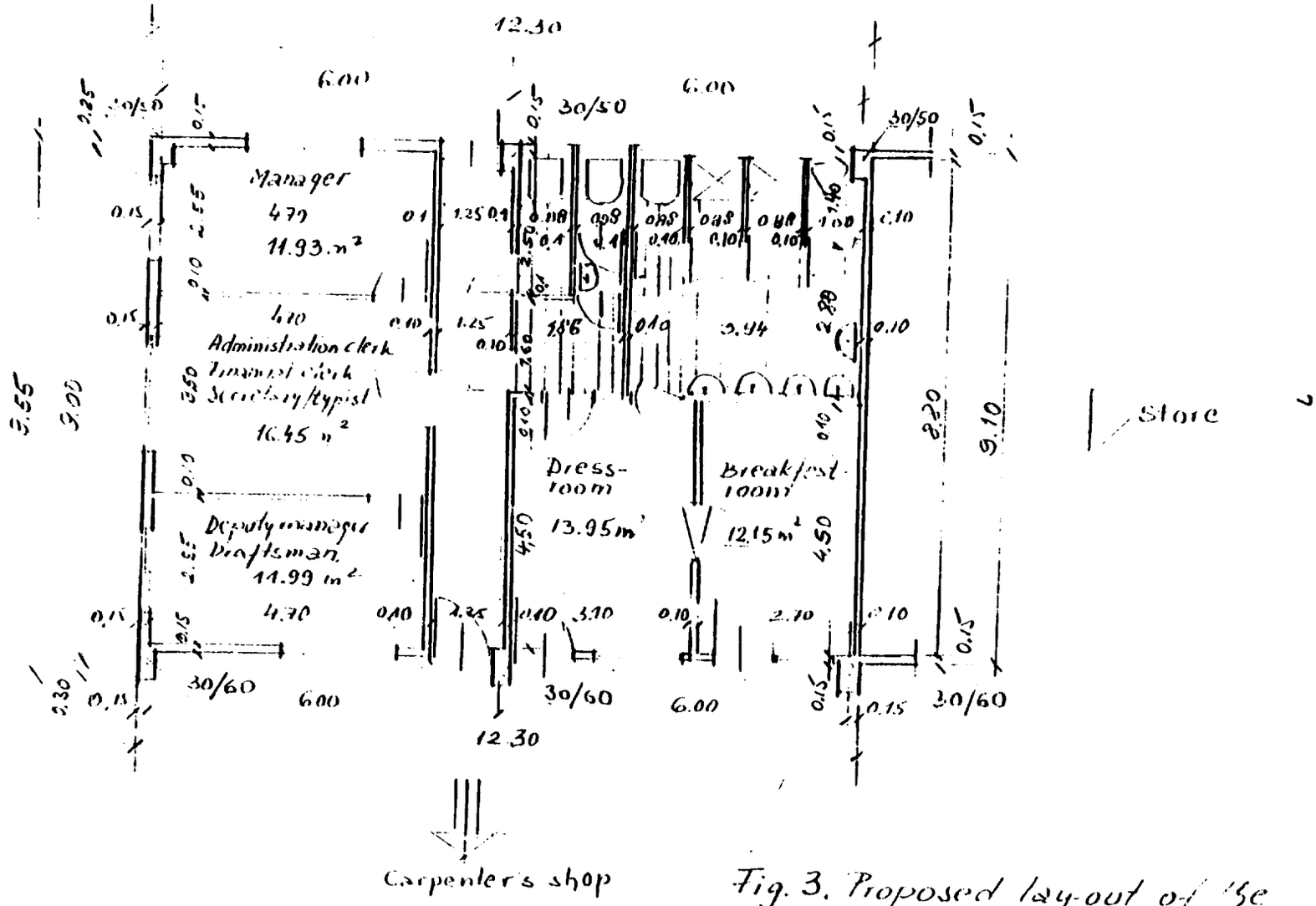


Fig. 3. Proposed lay-out of the office and rest rooms

The proposed layout of the office and rest rooms is presented on Fig. 3.

8. RECOMMENDED AND MINIMUM AREA OF THE BOATYARD

8.1	Boatbuilding and repair hall area	=	1000 m^2
8.2	Wood seasoning and storage area	=	800 m^2 (1400 m^2)
8.3	Launching and boat outfitting repair area	=	500 m^2
8.4	Roads, parkings and inside communication area	=	400 m^2 (500 m^2)
8.5	Outfitting storage area	=	(600 m^2)
	Total	=	2700 m^2 (minimum)
		=	4000 m^2 (recommended)

9. LOCATION OF THE BOATYARD AND AVAILABLE LAND AREA

According to the results of visits on the island Praslin the boatyard may be located on the beach of Baie Ste. Anne (Fig. 4). The main land piece which may be considered is denoted as building site PR 323 (Fig. 5) which is divided in three pieces PR 567, PR 568 and PR 569. The total area is about 2690 m^2. This may meet the minimum required area of the boatyard (according to point 8). A general layout of the boatyard for this area (Fig. 6) indicates that a good production line may be reached, whilst the slipway would be in this case on the direction 78°.

To increase the necessary building site and to meet the recommended area of the boatyard the land piece of about 1250 m^2 laying along the south boundary of PR 323 could be taken into consideration. Thus the total area would be about 3940 m^2, it is very near to the recommended (4000 m^2 according to point 8). This area may be used as additional wood seasoning and storage area as well as outfitting storage area.

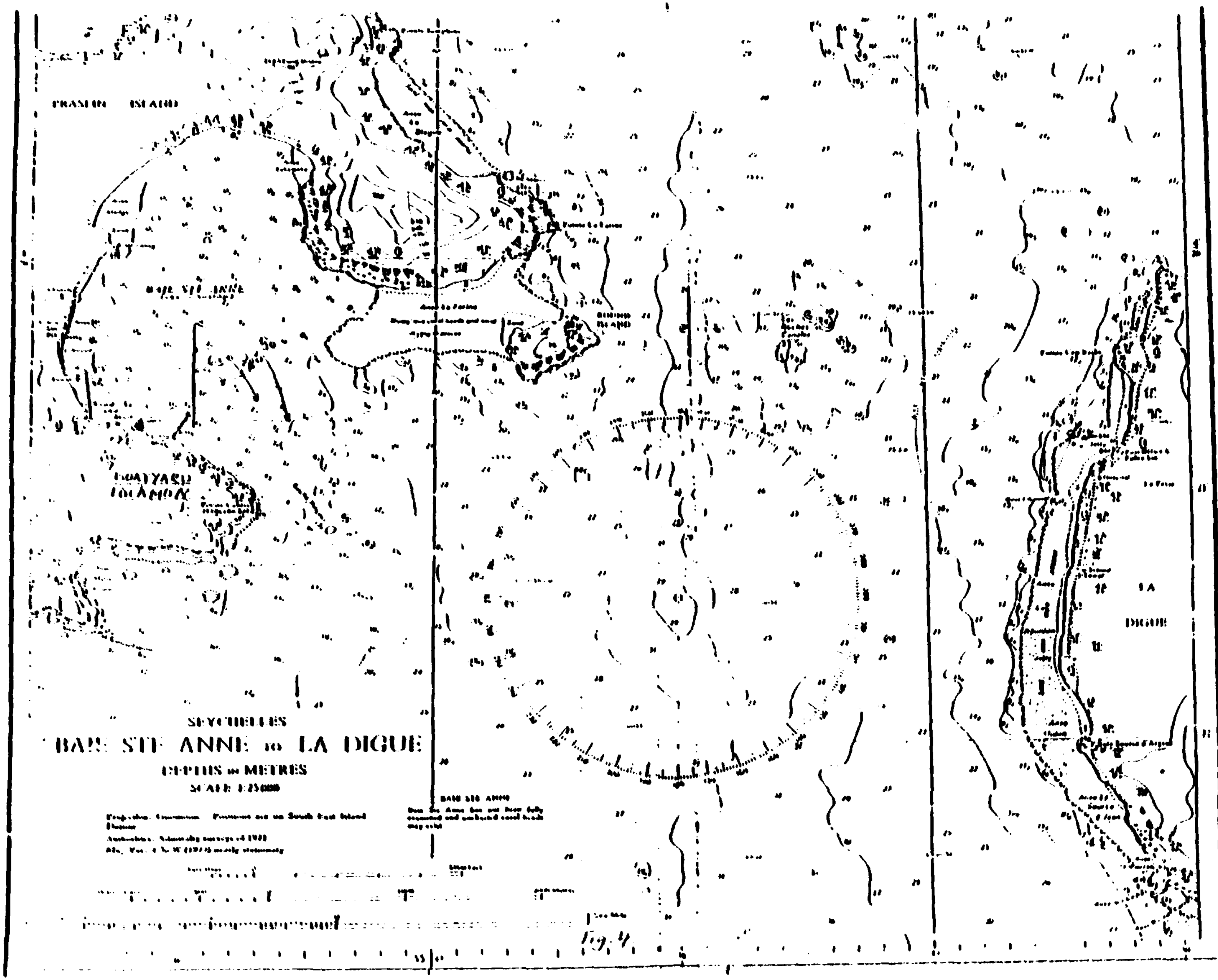

PRASLIN ISLAND
SEYCHELLES
BAIE STE ANNE to LA DIGUE
DEPTHS in METRES
LA DIGUE

Fig. 4

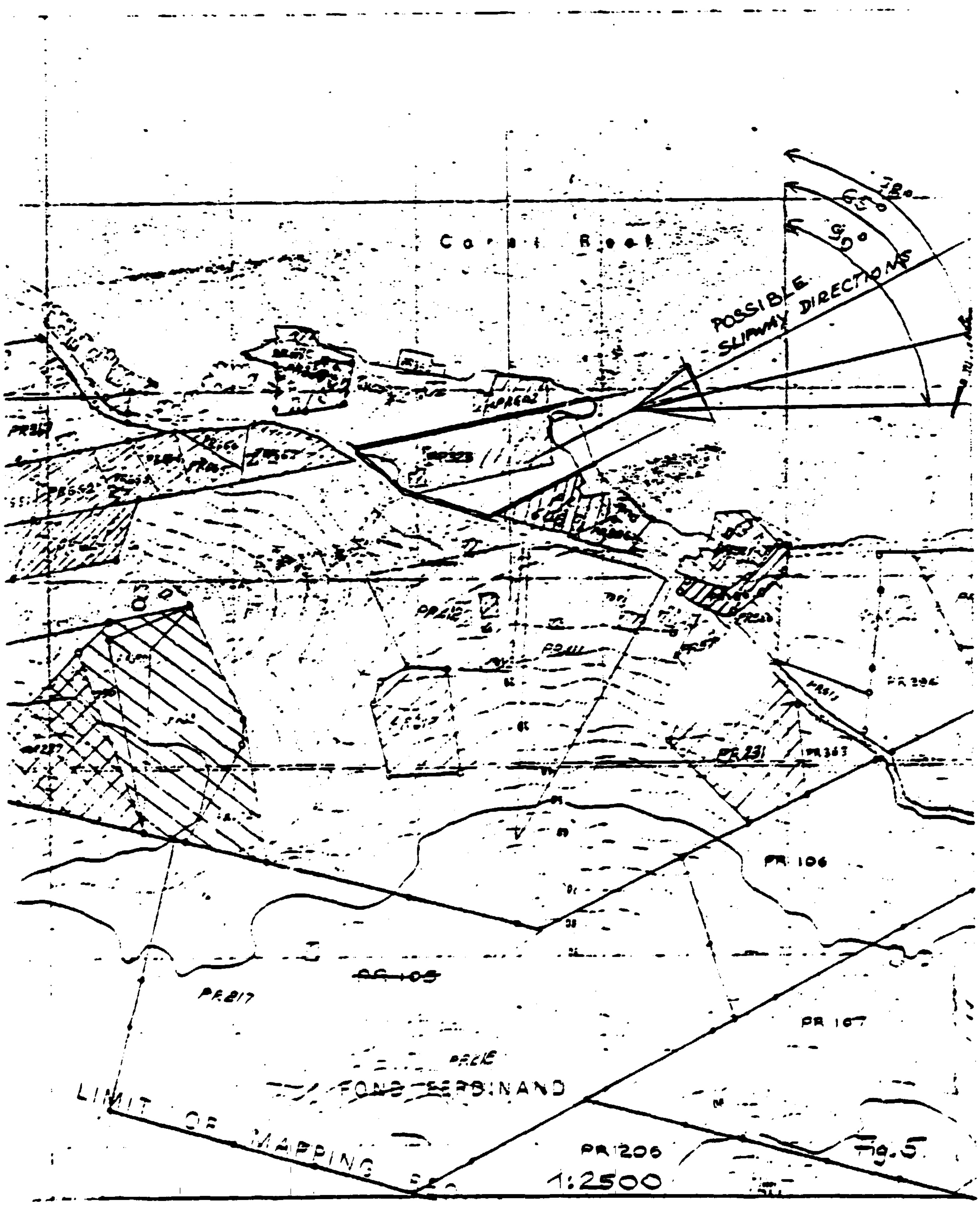

Coral Reef
POSSIBLE SLIPWAY DIRECTIONS
90°
65°
PR 106
PR 107
PR 217
PR 1206
PR 231
PR 363
FOND FERDINAND
LIMIT OF MAPPING

Fig. 5

1:2500

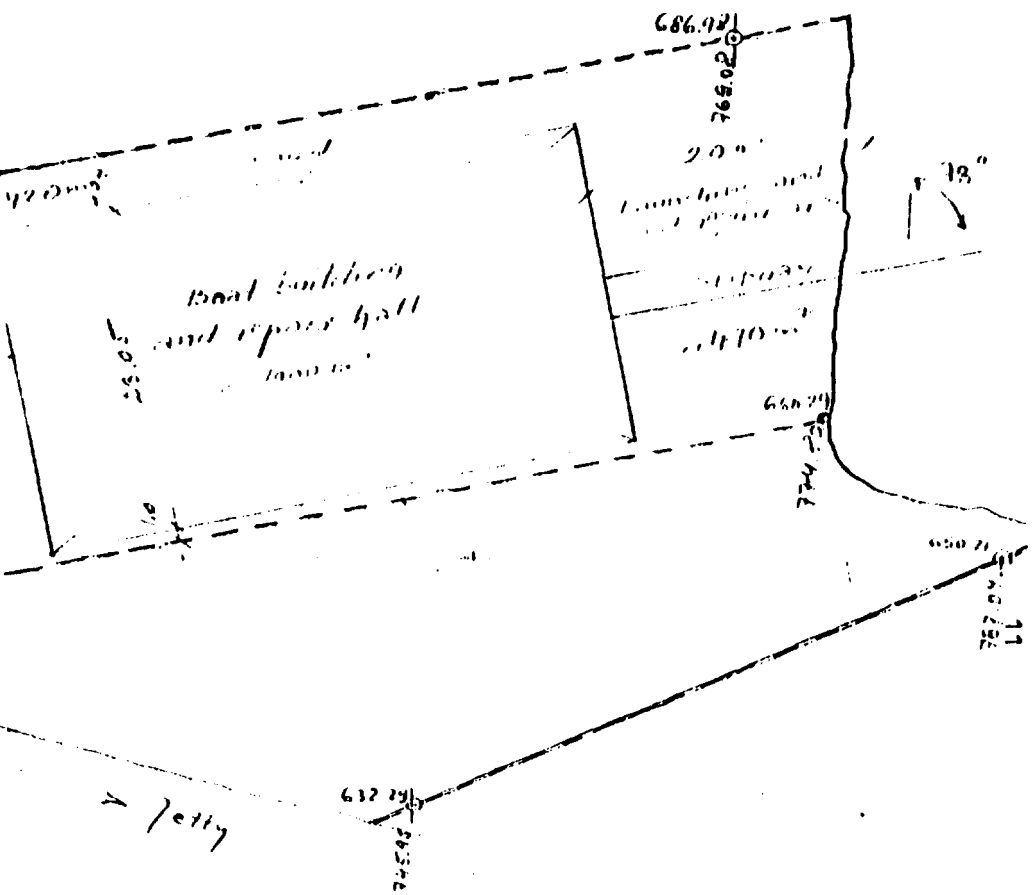
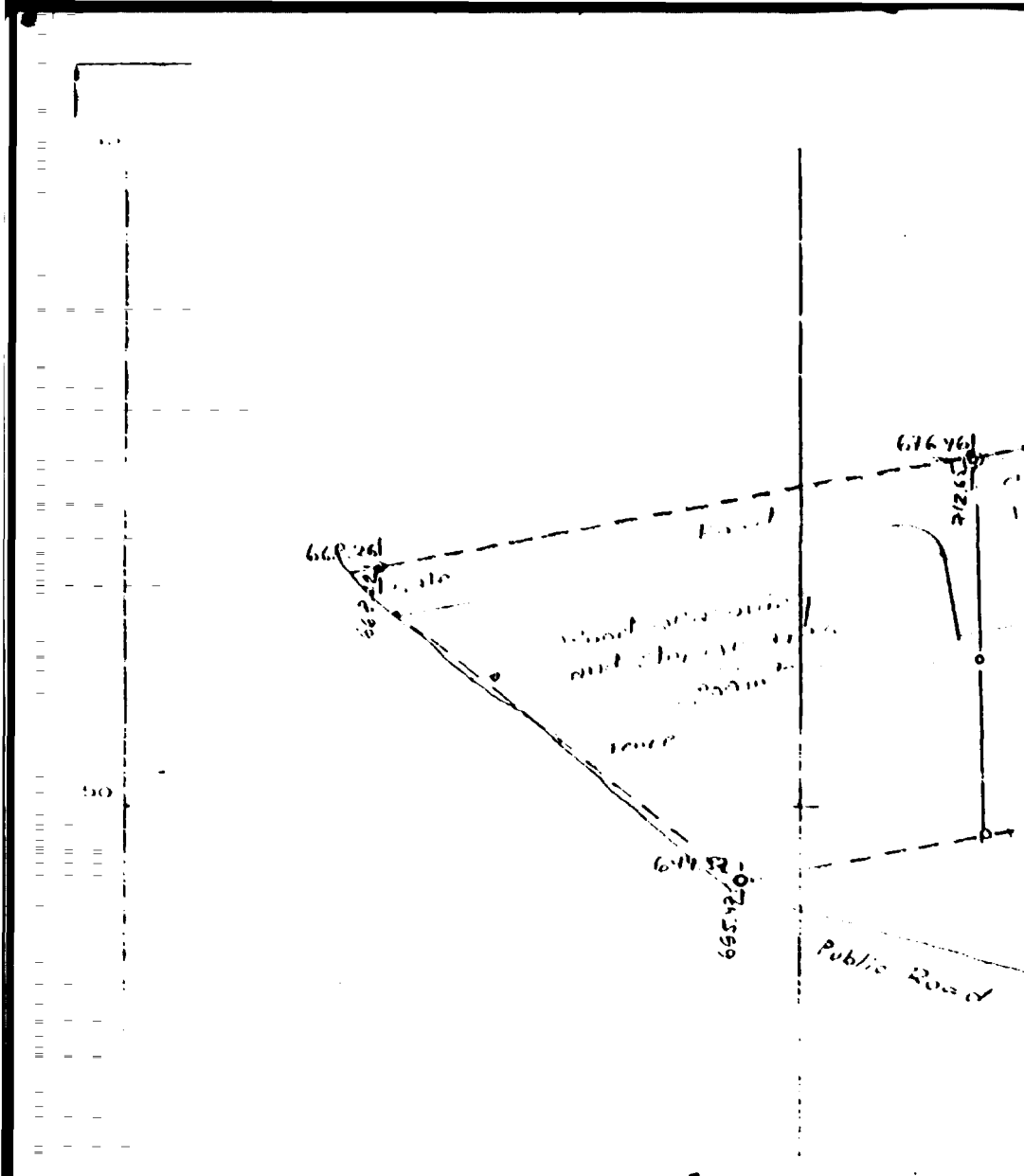


Fig. 6. General layout in the case of taking over ISC land parcel PR 323 (PR 567, PR 568, PR 569)



Total area ≈ 2690 m²

However, it is suggested that the land piece PR 323 should be reduced by pieces PR 567 and PR 568 due to the fact that on these two pieces two houses in which people are living exist. Thus the reduction of land area could mean 900 m^2 what gives a final building site area of about 3040 m^2. This building site is, however, very inconvenient for a good location of all boatyard activities. A proposal of the layout for this building site is given on Fig. 7. The direction of the slipway obtained for this layout is 90^0 which is not the most reasonable one because of the shape of the coast-line. Thus a considerable improvement could be achieved if the road to the yard might go at the same place as in the layout on Fig. 6. In such a case the boatbuilding and repair hall could be located parallel to the north boundary it is more or less in the same place as in layout on Fig. 6

The conclusion is at time being following that all efforts should be made in the case of leaving for the hitherto owners the land pieces PR567 and PR 568 to establish a road along the north limit (compare Fig. 6). This would also allow to establish a good size wood seasoning and storage area connected with the carpenters shop. Of course some other possible layouts of the boatyard exist, also such which may require a change of the assumed technological layout of the boatbuilding and repair hall. However, it is proposed to finalise first the purchase of both land pieces and then to decide about the layout of the whole boatyard. This should not delay the design work on the boatbuilding and repair hall.

Taking into consideration the mentioned building site it shall be stressed that it is possible to build an outfitting quay of the length equal to the width of the available parcels minus the width of the slipway. However, taking into consideration the available depth at low tide, dredging works would be in this case necessary. Thus a final decision in this field may be taken in the future after the boatyard is fully in operation.

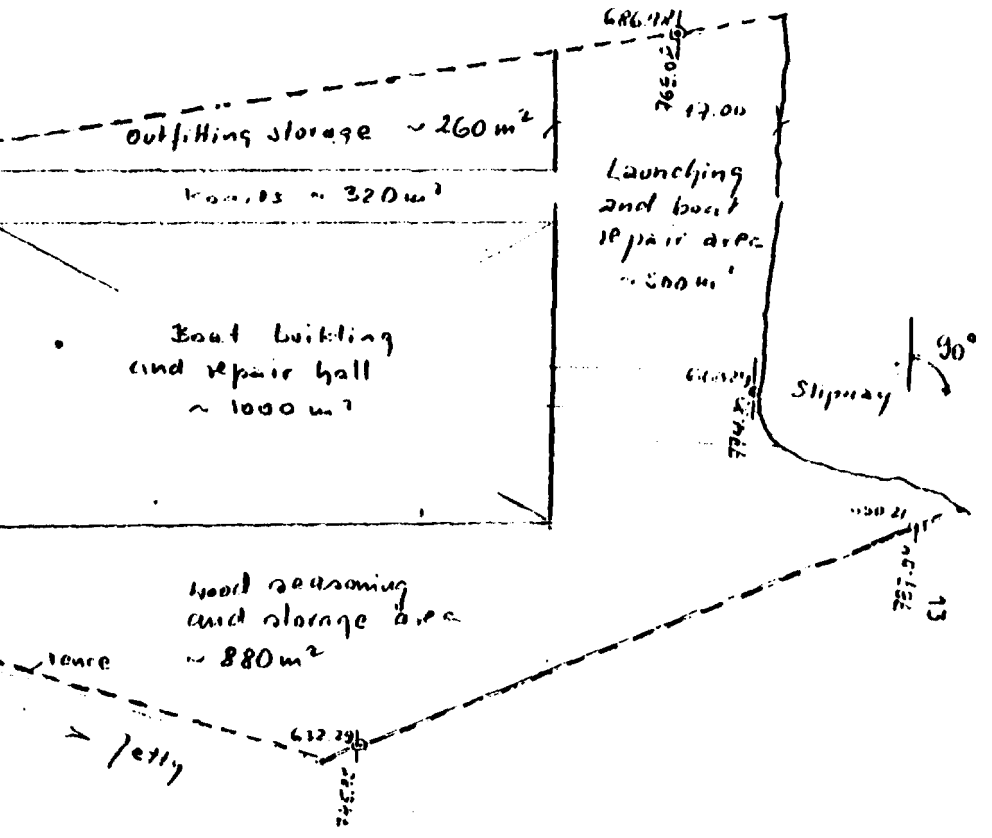
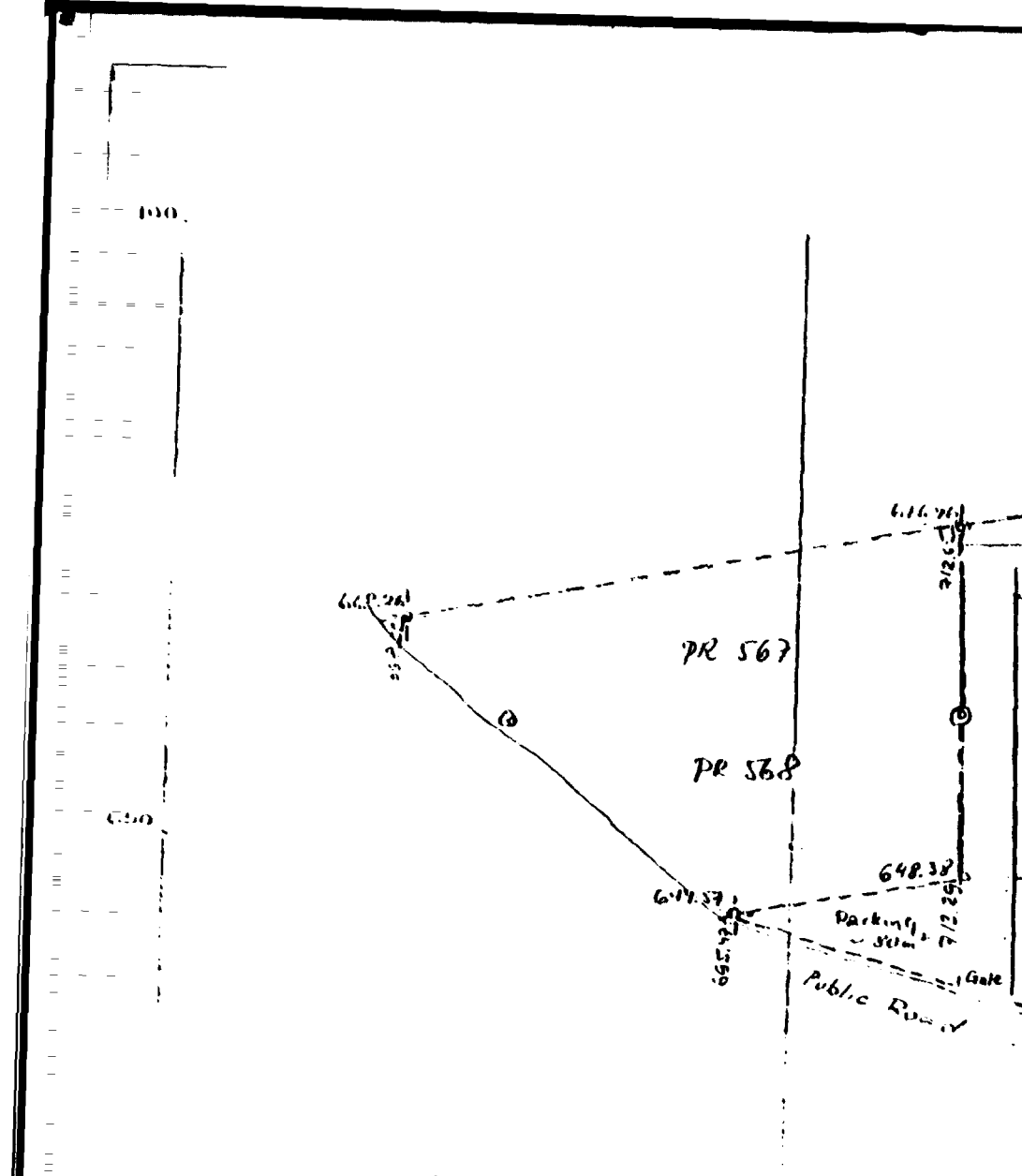


Fig. 7 General lay-out in the case of two land pieces reduced by PR 567 and PR 568



Total area ≈ 3040 m²

The chosen location area gives the directions of the slipway between 65° and 90°. Thus taking into consideration the configuration of the Baie Ste. Anne as well as the location of the island La Digue and the hills of the island Praslin, it may be assumed that the proposed boatyard area is well protected from all waves and main winds.

The existing tidal currents may not have an influence on the structural solution, although the influence on sand transportation may be significant. Thus observations of the currents, waves and sand transportation are mostly recommended particularly in the case of building of a quay wall as an outfitting quay.

The soil condition in the chosen area seems to be the same as in the surroundings where buildings on direct foundation are constructed. For the preliminary calculations it is recommended to use a value of allowable stresses under the foundation of $\sigma_{all} = 0.12$ MPa and a deformation modulus for settlement calculations of $E = 2.5$ MPa. The final values of the above parameters will be the subject of investigations after the levelling of the area and excavations of the first foundation pit.

Taking into consideration the rain periods and their duration, an inclination of the whole area of about 1% in the direction of the sea is recommended. In addition the water from roofs should be directed into separate trenches along the outside walls and longitudinal boundaries of the boatyard area.

At the end it should be mentioned that the chosen location of the boatyard has following advantages:

(a) Small distance from the unloading jetty in the Baie Ste. Anne.

(b) Direct connections with the main road of island Praslin.

(c) Considerably small distance to the power supply point as well as fresh water supply point.

(d) Deepest approach from the bay resulting in a narrow beach and in a high slope inclination.

(e) Defined due to performed investigations water levels for different tide periods.

The above advantages will lower considerably the construction costs as well as transportation costs not only during the construction but also during the operation period. Taking additionally into consideration the fact that the boatyard will be sheltered from waves and main winds one has to state that the proposed location is at the time being the best for the island Praslin.

10. UTILITIES

11.1 Electric energy - delivered directly from the state power plant (240 and 380 V).

11.2 Compressed air - own air compressor (if necessary).

11.3 Oxygen, Acetnylene, Propane - delivered in gas cylinders.

11.4 Fresh water - delivered directly from the state water-pipe network to boatyard water tank of a daily use capacity. Inner distribution from water tank by own separate water-pipe network.

11.5 Sewage system - own septic tank.

11.6 Fuel oil - delivered from filling station at Praslin.

11. LAUNCHING - DOCKING FACILITY

The following launching - docking facilities have been considered:

11.1 Longitudinal slipway using boat cradles with wheels on tyres.

11.2 Longitudinal slipway using boat cradles with rail wheels.

11.3 Mobile crane.

11.4 Trailer hoist.

11.5 Marine hoist.

Taking into consideration the fact that the launching weight of wooden boats of the length of 12 m is about 8 to 10 metric tons and that the Baie Ste. Anne of the island Praslin has mean water level differences due to the tide of about 1.30 m, (Fig. 8) a longitudinal slipway with cradles of tyred wheels (Fig. 9) is above all recommended. The construction of the slipway (Fig. 10) would then consist of reinforced concrete slab of the inclination of about 1:10, laid on a layer of crushed rock. It is recommended to reach with the slab end at least the lowest low water level. The boat is designed to be set on wheeled cradles having altogether four wheels. That enables to travel even on rough terrain (e.g. before pavement is laid on the repair area). The fitting of the wheeled cradles is made just before launching it is when the number of permanent supports may be considerably reduced.

12. TIMBER

The following kinds of timber are used for boatbuilding at the Seychelles Islands:

(a) Takamaka

(b) Calice du Pape

(c) Mahogany

(d) Santol Indicum.

However, no information is available on the strength parameters as well as the density or unit weight. At the present time is used for boatbuilding mostly takamaka timber which ought to be durable in sea water provided that anti-fouling painting has been applied.

It is suggested that for the improvement of the timber quality a proper seasoning of it should be applied before the use. The proper space for the seasoning is foreseen in the boatyard layout.

The amount of timber per year necessary for the output of the boatyard may be estimated to be between 150 and 200 metric tons.

M

1.90 H.H.W. (Highest High Water)

1.60 M.H.W. (Mean High Water)

0.98 M.S.L. (Mean Sea Level)

0.30 M.L.W. (Mean Low Water)

0.00 CHART DATUM
L.L.W. (Lowest Low Water)

Fig. 5. Water levels at Baie Ste. Anne Prasiin

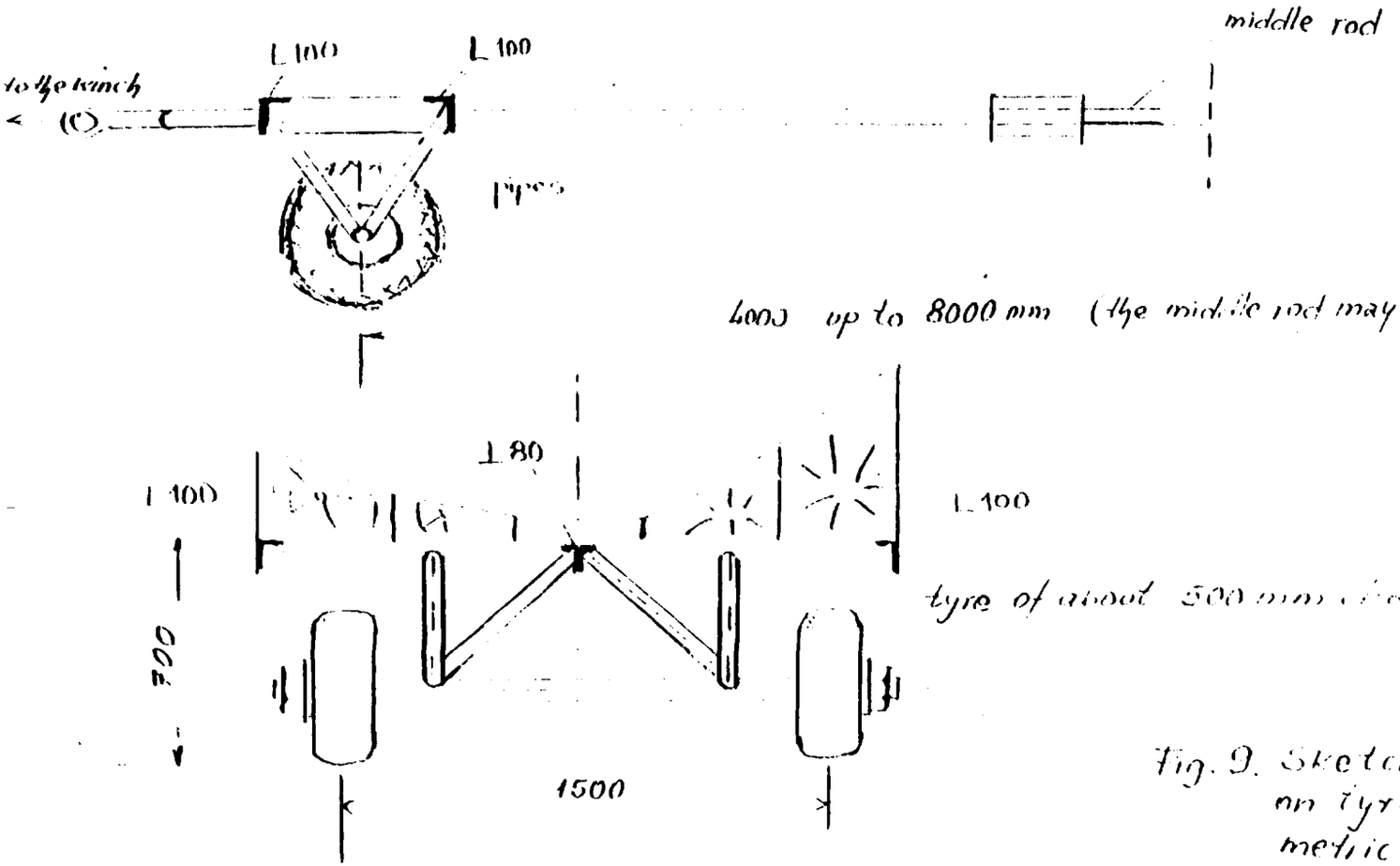
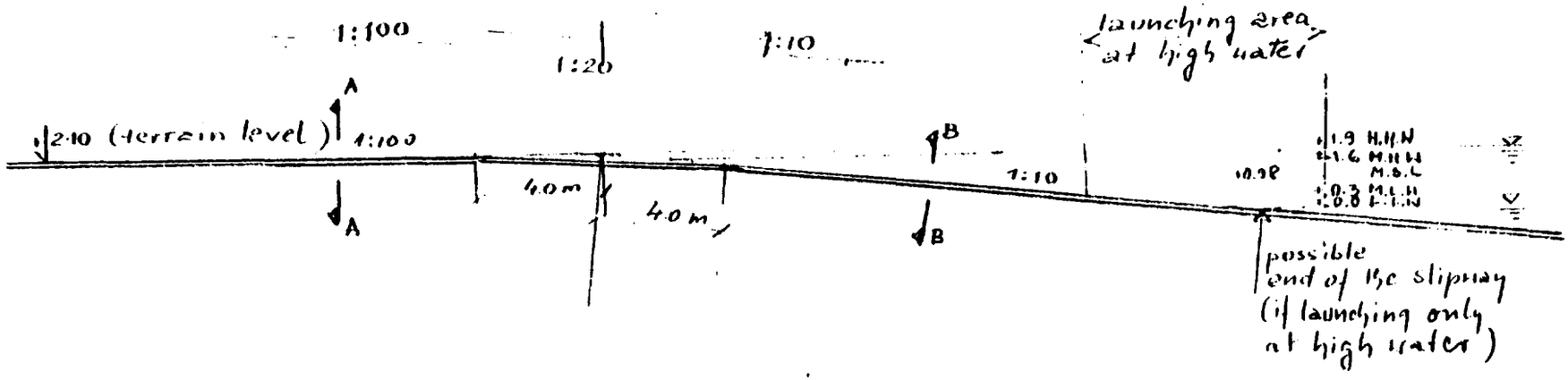
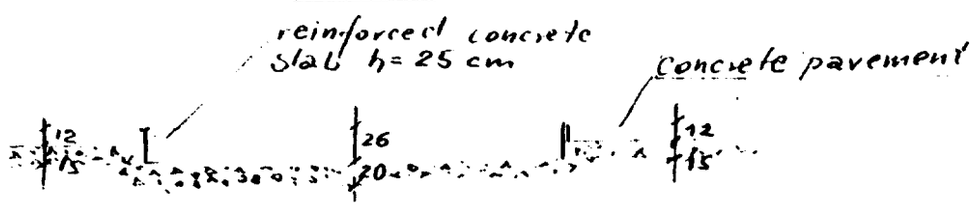


Fig. 9. Sketch of a boat cradle on tyred wheels of 10 metric tons capacity



A – A

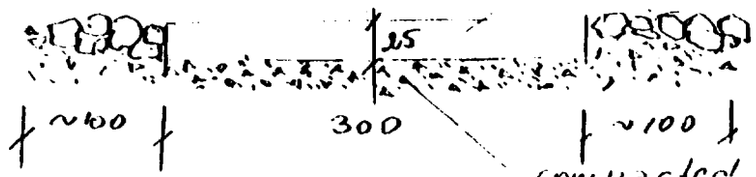


compacted layer of crushed stones and course sand or gravel

300

B – B

reinforced concrete slab h= 25cm



compacted layer of crushed

Remark:
The necessary maximum depth of water for launching is 0,7+0,8= 1.5m

Fig. 10. General dimensions and structural solution of the slipway

13. OUTLINE OF BOATBUILDING PROCESS (GENERAL EQUIPMENT INDICATIONS)

Operation	Process	Handling
13.1 Wood delivery	by lorries or boats	fork-lift truck or manually
13.2 Wood drying	by seasoning	fork-lift truck or manually
13.3 Wood impregnation	by hot bath	fork-lift truck or manually
13.4 Keel, stem and sternport treatment	by choosing of naturally shaped trunk or gluing in a manually operated press of planks prepared by using among other circular and band saws and moulding machine; finish by the use of carpenter manual and electric tools;	fork-lift truck and mobile crane or hoisting tackles
13.5 Planks treatment	by the use of thicknessing and planing machines and circular or band saws;	manually
13.6 Frames (ribs) treatment	by choosing of naturally shaped trunk or nailed or glued from planks; using of circular and band saw, as well as carpenter manual and electric tools;	manually

13.7 Planks bending	by putting the planks into steam tank and bending manually using clamps while assembling; fitting with bolts;	manually
13.8 Assembly	by laying the keel and joining it with stem and sternpost by use of bolts; fitting of the frame (rib) templates; assembling of the shell planks (hot), bulkheads (if any), longitudinals and deck planks (hot); fitting the frames (ribs) and beams with bolts; dismantling of frame (rib) templates. If several layers of shells are foreseen a mastic coathed cloth between shell layers shall be laid, riveting of shell planks using copper rivets and bolts; using of carpenter manual and electric tools.	fork-lift truck, mobile crane and hoisting tackles
13.9 Outfitting	by placing, fastening and aligning of the propeller, propeller shaft, engine and all foreseen mechanical and electrical equipment, pipelines, cables etc. using of mechanical and electrical tools.	fork-lift truck, hoisting tackles and manually.

13.10 Caulking and painting	by using manual tools	manually
13.11 Launching	by placing the boat on launching cradle and and launching using steel rope.	manually and winch
13.12 Sail's sewing	by using sewing machine and manual tools.	manually

14. OUTLINE OF BOAT MAINTENANCE (REPAIR) PROCESS (GENERAL INDICATIONS)

It is generally assumed that the maintenance (repair) process may contain all works introduced in boatbuilding. Additionally works are concerned with dismantling of equipment and engine as well as shawing and cleaning of of the whole hull before painting. All necessary replacements of planks etc (hull repair) are made by carpenters using carpenter manual or electric tools. The treatment of planks is the same as in boatbuilding.

The inspection and maintenance service as well as repair (if necessary) of the mechanical equipment as well as the engine, pipelines and tanks is made either in the mechanical and electrical shop or on the boat in the case when the elements considered are not dismantled. These inspections, maintenance services and repairs may be carried out with the boat out of water (dry) or alongside a berth (wet). It is generally assumed that the accepted way of boat handling (dry or wet) will depend on the scope of construction works being made (only slipway, slipway plus outfitting quay, etc).

In addition to the main categories of maintenance service and repair it may be a need for specialised repair of navigation equipment and cooling installations (if any). In such a case it has to be decided if the maintenance service or repair has to be done by the shipyard employees or ordered at a specialised repair company.

Generally it is assumed that in the boatyard the repair work will be done on boats built only by boatyard in consideration. This means that the planning of short term maintenance services and repairs as well as long term repairs have to be agreed in advance with the boat owners and the boat management. As short term maintenance services and repairs may be defined these which contain hull shawing and cleaning, engine and propeller maintenance, painting and general refurbishments. Long term repairs contain hull repairs, engine and propeller renovation as well as general refurbishment. It is here assumed that a short term maintenance service and repair may require docking but not more than one week while the long term repairs will be made in dry and of three weeks. Thus the planning of maintenance services and repairs in addition to the boat building activities is an essential element in the organisation of the boatyard work as well as in its productivity and economical results.

15. BOATYARD BASIC EQUIPMENT

15.1 Hull building and hull repair workshop (in brackets are given the lowest amounts)

1.	Circular saw (cutting depth 115 mm)	- 2 pcs (1 pc)
2.	Band saw (wheel dia 630 mm and 800 mm)	- 2 pcs (1 pc)
3.	Thicknessing machine (up to 250 x 630 mm)	- 1 pc
4.	Planing machine (up to 400 x 20 mm)	- 1 pc
5.	Down spindle wood moulding machine (max cutter dia 100 mm, table 900 x 1100 mm)	- 1 pc
6.	Sharpening machine	- 1 pc
7.	Carpenter bench (2.0 x 0.7 m)	- 6 pcs
8.	Boiler	- 1 pc
9.	Steam tank (6.0 m x Ø 1.0 m - 50kP a)	- 1 pc
10.	Racks (2.0 x 0.5 m)	- 2 pcs
11.	Hand-operated polishing machines	- 4 pcs (2 pcs)
12.	Tools for hull caulking	- 1 set
13.	Tools for painting	- 2 sets (1 set)
14.	Portable electrical drills	- 6 pcs (4 pcs)

15. Carpenters' tools and workshop accessories - 5 sets (3 sets)
16. Sail's sewing machine - 2 sets
17. Hand-mechanical jack (2 metric ton capacity) - 2 pcs
18. Monorail hand-operated hoisting tackle (1 metric ton capacity) - 3 pcs (2 pcs)
19. Hand-operated hoisting tackle (0.5 metric ton capacity) - 3 pcs (2 pcs)

Under the position of tools e.g. for carpenters etc one has to understand all tools necessary for the carpenter's work e.g. steel angle, carpenter marker, level, carpenter axe, hand saw, knife saw, planes (scrub, jack, smoothing, shooting, arcular etc), chisels, hammers, clamps, scrapers, rasps, files, tongs etc. The final specification of these tools and workshop accessories should be made by the production engineer.

15.2 Outfitting and repair workshop

1. Universal lathe (1-1500 mm, ∅ - 560 mm) - 1 pc
2. Hack saw (up to 500 mm dia) - 3 pcs (2 pcs)
3. Boring - milling machine - 1 pc
4. Universal milling machine - 1 pc
5. Universal sharpener - 1 pc
6. Hand-hydraulic pipe bender - 1 pc
7. Electrical and gas welding equipment (250 A transformer welding, gas welding set, welding torch set, acetylene generator) - 1 set
8. Oxy-acetylene cutting equipment - 1 set
9. Tools and workshop accessories for mechanics - 2 sets (1 set)
10. Tools and workshop accessories for electricians - 3 sets (2 sets)
11. Guillotine shears (up to 2000 x 3 mm) - 1 set
12. Hydraulic jack (2 metric ton capacity) p
13. Racks (2.0 x 0.5 m) - 9 pcs

14. Fitter's table (2.0 x 0.7 m) - 2 pcs

15. Electrician's table (2.0 x 0.7 m) - 1 pc

16. Hand-operated hoisting tackle (1 metric ton capacity) - 2 pcs

The remark given in point 15.1 is also valid here. In addition it may be considered to use pneumatic tools.

15.3 Store

1. Self supporting shelves (width 1.0 m) - 24.0 m
2. Blocks (pulley blocks) - 2 pcs
3. Hand-industrial truck - 1 pc
4. Mobile crane (8 metric ton capacity) - 1 pc
5. Fork lift truck (2 metric ton capacity) - 1 pc

15.4 Equipment layout

The proposal of the layout of the equipment in different workshop is presented on Fig. 11.

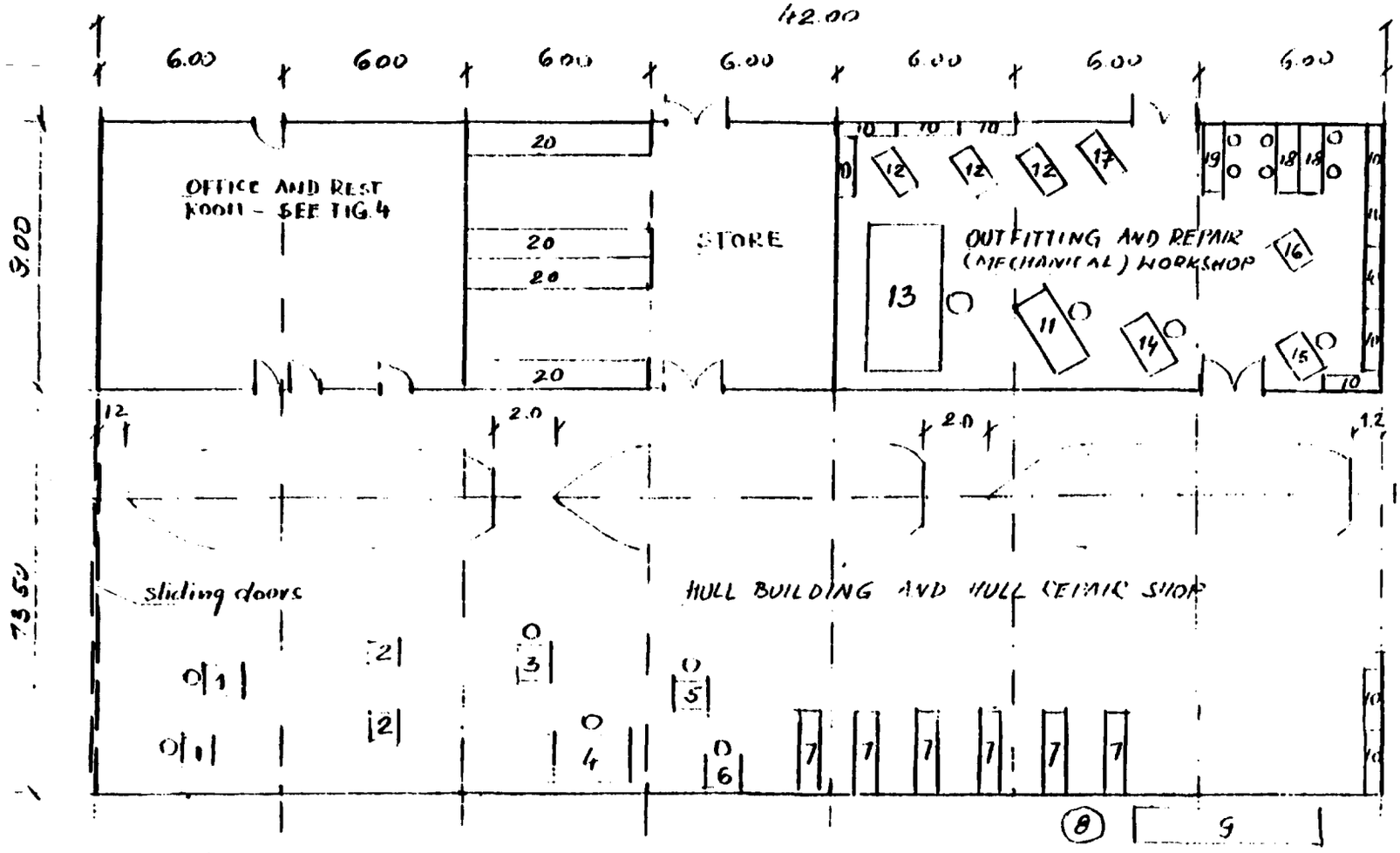
15.5 Launching-docking equipment

1. Launching-docking winch (1.5 metric ton capacity) - 1 pc
2. Launching - docking rope - 100.0 m
3. Launching-docking cradle on four wheels (10.0 metric ton capacity) - 1 pc

16. THE PROPOSAL OF THE STRUCTURAL SOLUTION OF THE BOATBUILDING AND REPAIR HALL

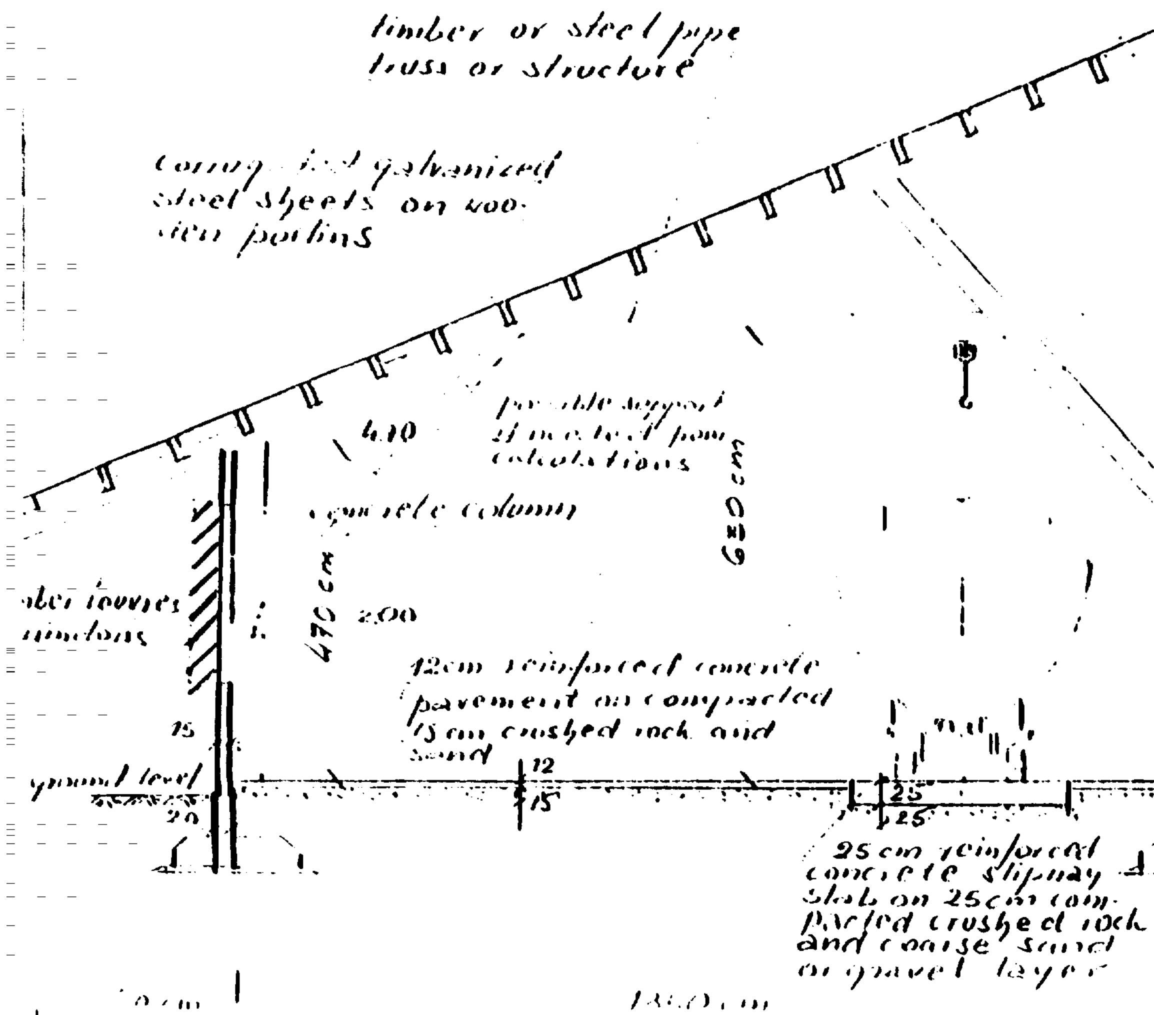
The boatbuilding and repair hall (Fig. 12) consists of three rows of supports made as reinforced concrete columns of dimensions estimated in the structural calculations. The preliminary column dimensions are assumed to be 30 x 60 cm for the greater span (13.5 m) and 30 x 50 cm for the smaller span (9.0m). The columns are fixed in reinforced concrete footings calculated for the allowable stresses in the soil (point 9). A layer of 10 cm lean concrete under the footings is recommended.

The outer walls of the the thickness of 15 cm and the inner of the thickness of 10 cm are made from concrete blocks. The walls are from both sides plastered



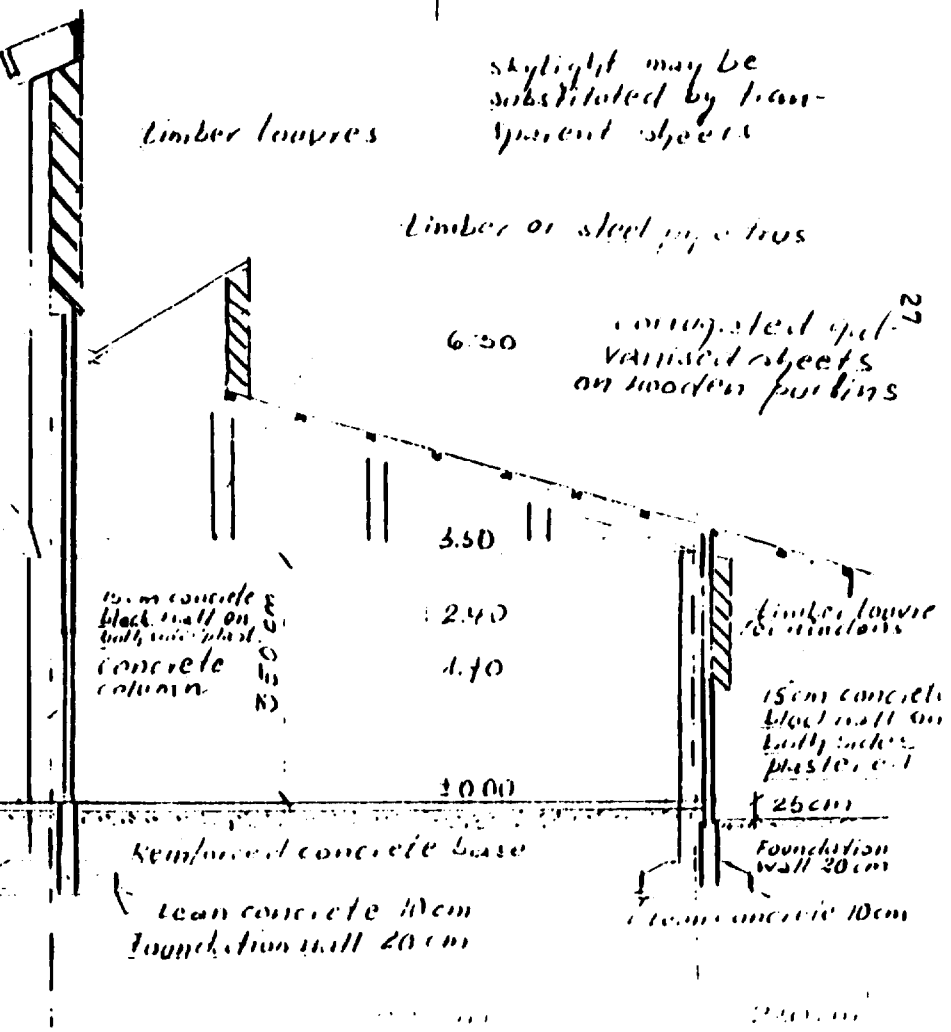
1 circular saw
2 band saw
3 thicknessing machine
4 planing machine
5 down spindle wood moulding machine
6 sharpening machine
7 carpenter bench
8 boiler
9 steam tank
10 racks
11 universal lathe
12 hack saw
13 boring - milling machine
14 universal milling machine
15 universal sharpener
16 hand-hydraulic pipe bender
17 guillotine shears
18 fitter's table
19 electricians table
20 self supporting shelves

Fig. 11 Technological lay out of the boatyard



timber or steel pipe
truss or structure
steel sheets on woo-
den purlins
4.10
calculations
690 cm
470 cm
2.00
pavement on compacted
15 cm crushed rock and
sand
15
ground level
20
12
15
25
25
25 cm reinforced
concrete slipway
slab on 25cm com-
pacted crushed rock
and coarse sand
or gravel layer

Fig. 12. Sketch of the structural solution of the boat building and repair hall.



/strip The floor outside the 3.0 m wide / for launching cradles (see Fig. 10) is made as reinforced concrete pavement of the thickness of 12 cm. Expansion joints filled with bitumen should be foreseen at distances no larger than 6.0 m. The concrete pavement should be laid on a compacted layer of crushed stones and course sand or gravel of the total thickness of about 15 cm.

The carrying structure of both roofs is made either from timber or steel pipe trusses to which wooden purlins are fastened. The roofing consists of corrugated galvanised steel sheets bolted to purlins.

The windows are of the normal type whilst in the ventilation openings in the roofs and in the walls timber louvres are installed. Also transparent corrugated sheets placed as parts of the roofing may be used for lighting purpose, particularly in the carpenters workshop.

On the roofing trusses the possibility of fastening of monorail hand-operated and hand-operated hoisting tackles should be provided. Such a possibility should be, however, proved by structural calculations.

The heights of the different hall workshop are estimated as follows:

(a) The workshops under the roofing of 9.0 m span - height 3.5 m.

(b) The workshops under the roofing of 13.5 m span - height = height of launching cradle + height of the boat + height of one worker + height of the monorail tackle = 0.70 + 3.20 +1.80 +0.60 = 6.30 m.

The proposal of the structural solution of the boatbuilding and repair hall given on Fig. 12 is one of possible examples. The final solution prepared for approval may take into consideration the proposed on Fig. 12, however, the selection of material (timber, steelpipes) must be made on the basis of local possibilities. In any case the main dimensions as width, length and height of both parts of the hall have to be kept as indicated on Fig. 12. On Fig. 13 and 14 two additional proposals of structural solution of the boatbuilding and repair hall are given.

The gable walls above the level + 3.50 cm for the lower part of the hall and above the level + 6.30 for the higher part of the hall have to be made as wooden plankings.

In addition in minimum two fields of the hall stiffeners for the longitudinal stability of the hall shall be introduced. These stiffeners may be made as two crossing tension rods placed between the trusses.

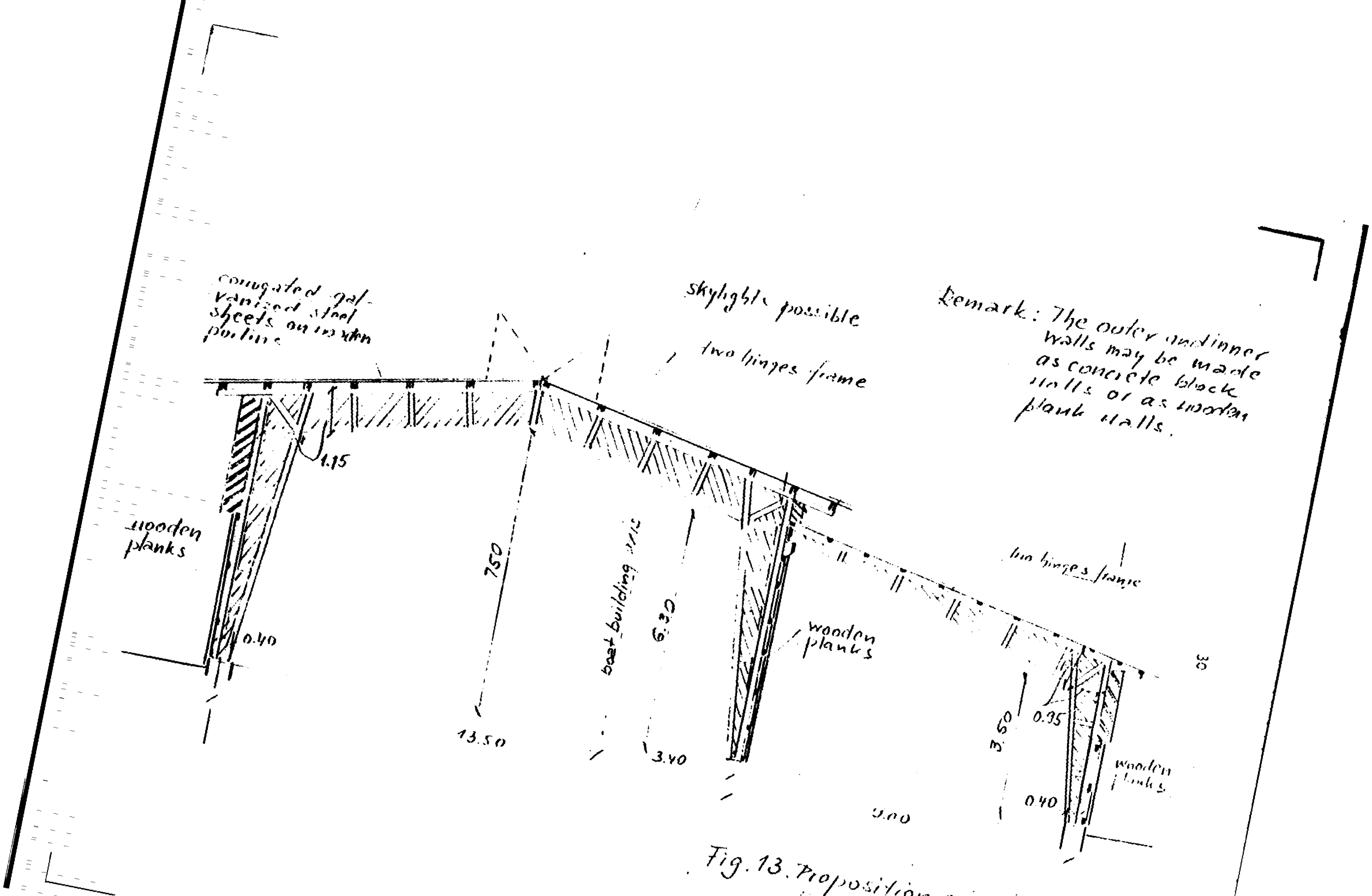
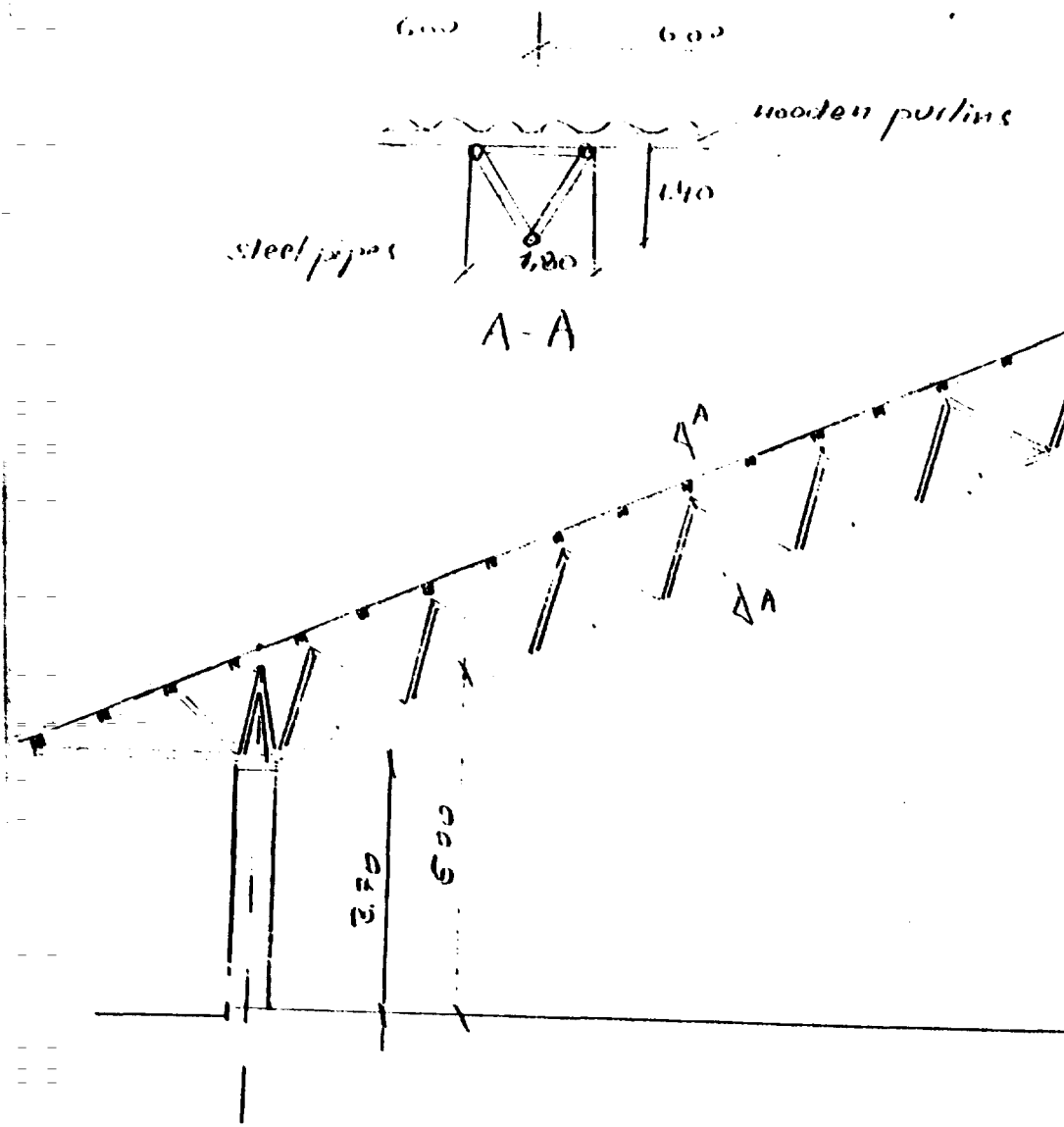


Fig. 13. Proposition of structural solution of the boatbuilding and repairing hall-frames from wooden planks


wooden purlins
steel pipes
1,40
1,80
A - A
A
A
2,20
6,00

Remark: All other dimensions and details are on Fig. 12

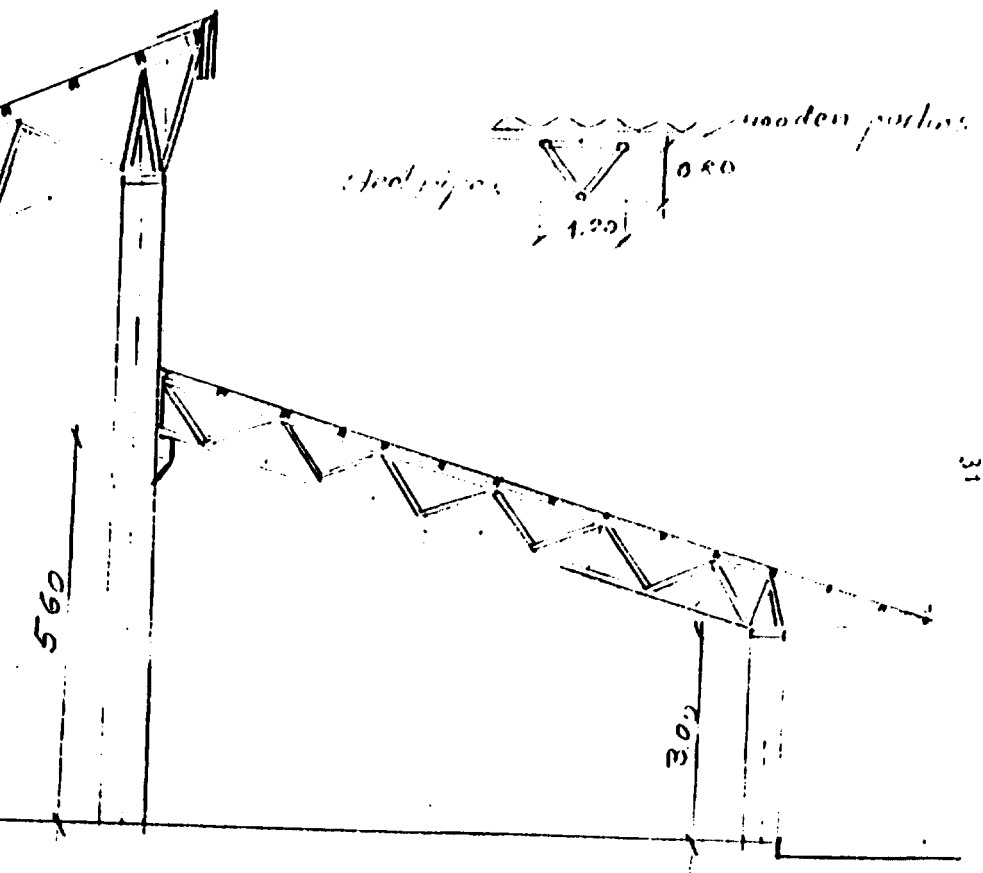


Fig. 14. Proposition of structural solution of the boat building and repair hall-houses from steel pipes

ANNEX II

BOATYARD AND BOAT MAINTENANCE COMPLEX PRASLIN, SEYCHELLES

TIME SCHEDULE

1. Purchasing of the land at island Praslin - 15 March 1982.

2. Survey, soil investigations and sea bottom level measurements in the prolongation of the waterfront of the area into consideration - 15 April 1982.

3. Cleaning of the site and preparations for starting of construction works (removal of houses, rocks, stones, trees and levelling). - 31 May 1982.

4. Finishing of all structural calculations and detailed drawings for the boatbuilding and - repair hall - 15 April 1982.

5. Finishing of all detailed drawings of the water supply and sanitary systems - 15 April 1982.

6. Finishing of all detailed drawings of the self made equipment: carpenter's benches, fitter's tables, electrician's tables, rocks, self supporting shelves and steam tank - 30 April 1982.

7. Approval of all structural calculations and detailed drawings (pos. 4 to 6) - 30 April 1982.

8. Finishing and approval of all structural calculations and detailed drawings of the slipway structure and of the boat-launching and docking cradles - 30 April 1982.

9. Approval of the equipment types, prices and deliverers - 30 April 1982.

10. Start of the construction works on boatbuilding and - repair hall, roads and fences - 1 June 1982.

11. Finishing of detailed drawings of the electrical energy supply system - 30 June 1982.

12. Start of installation works on electrical energy, water, sewerage systems - 1 January 1983.

13. Finish of all construction and installation works connected with boatbuilding and repair hall as well as roads and fences - 30 June 1983.

14. Construction of the slipway and launching -docking cradles - 31 December 1983.

15. Purchasing of all boatbuilding and - repair yard equipment - 30 June 1983.

16. Installation and putting into operation of all boatbuilding and repair yard equipment - 31 December 1983.

17. Start of training of staff members - 1 July 1983.

18. Start of boatbuilding and repair - 1 January 1984.

ANNEX III

PROPOSALS CONCERNING THE REALISATION OF THE PROJECT ACTIVITIES OF UNIDO AT THE ERECTION OF THE BOAT YARD AND BOAT MAINTENANCE COMPLEX ON THE ISLAND PRASLIN, SEYCHELLES

PROJECT NUMBER: UF/SEY/80/044

1. The UNIDO's project activities connected with establishment of a new boat yard and boat maintenance complex on the island Praslin were expected to consist of:

   1.1 Provision of expert services for the duration of the project.

   1.2 Supply of necessary equipment and its installation.

   1.3 Training of counterpart personnel locally and abroad.

   The above items are evaluated as follows:

   1.1.1 Ship-building expert project coordinator (job description UF/SEY/80/044/11-01) - total amount US $160,100

   1.1.2 Expert in yard and slipway design (job description UF/SEY/80/044/11-02/31.9.D) - total amount US $11,800 + 5,200 = 17,000

   1.1.3 Short term consultants - total amount US $40,400 + 17,600 = 58,000.

   1.2.1 Supply of equipment - total amount US $263,000.

   1.3.1 Training - total amount US $20,000

   1.4 Miscellaneous - total amount US $10,900.

   Total amount of UNIDO's input: US $529,000.

2. Due to the fact that the ship-building expert as well as the whole boatbuilding and maintenance equipment are necessary not earlier than after total finishing of the construction works of the new boatyard hall together with the launching-docking facilities, several proposals concerning the UNIDO's activities are made. The proposals are as follows:

   2.1 To cancel in the UNIDO's project the position of <u>ship-building expert</u> for total amount of US $160,100.

   2.2 To cancel in the UNIDO's project the position of <u>supply</u> of equipment for total amount of US $263,000.

   2.3 To increase in UNIDO's project the position of <u>training</u> to total amount of US $50,000.

2.4 To introduce in the UNIDO's project a new position for erection of the boatyard for a total amount of US $373,000.

2.5 To connect in the UNIDO's project the position of expert in yard and slipway design and short-term consultants as expert services for a total amount of US $75,000.

3. The above given proposals are based on the following assumptions:

3.1 The increase of the position training should allow a one year long stay of the nominated production engineer of the new boatyard at a modern boatbuilding yard in an agreed country to learn new management methods, new boat-building and maintenance technologies, new boatyard organisation methods as well as to learn the use of new equipment and materials. This person after one year training should start to work at Praslin as the project-coordinator of the new boatyard and organise the delivery of equipment, supervise its installation, train the staff members and prepare the boatyard for full scale production. The training should start at least at the beginning of July 1982 and be finished not later than at the end of June 1983.

3.2 At the time of the training of the nominated production engineer, the construction works of the new boatyard hall and connected facilities are proceeding. Following time schedule is proposed:

(a) Design of the boatyard hall and of the launching-docking facilities - end of April 1982.

(b) Preparation of the land for starting of construction works - end of May 1982.

(c) Construction of the new boatyard hall, roads and fences - end of June 1983.

(d) Construction of the choosen launching-docking facility end of December 1983.

(e) Installation of the full boatyard equipment - end of December 1983.

(f) Achievement of the full annual boatbuilding capacity - end of June 1984.

3.3 During the design, construction and operation period i.e. until the end of June 1984, the services of UNIDO's experts (pos. 2.5 - expert services) will take place. The periods of their visits will be the subject of separate agreements based on the realisation of the general time schedule.

3.4 The introduction of the position 2.4 erection of the boatyard shall allow an immediately start with the preparation of the land-area for the new boatyard as well as with the construction of the boatyard hall and choosen launching-docking facility. It should also allow to supply the new boatyard with electricity and fresh water as well as to erect and put into operation the sanitary system.

4. The proposals of changes of the UNIDO's project given above would allow on an immediately start of all design and construction works as well as on the training of the staff for the future boatbuilding and maintenance works in the next boatyard.

5. Taking into consideration the recent economical situation in the country the Government of Seychelles does not see any other possibilities to start the construction works, to keep the proposed time-schedule and to achieve the full production capacity at the foreseen time.

ANNEX IV

BOATYARD AND BOAT MAINTENANCE COMPLEX PRASLIN, SEYCHELLES

EXPERTS SERVICES TIME SCHEDULE

1. Approval of structural calculations and drawings of the boatbuilding and repair hall and of the slipway structure; approval of the equipment types, prices and deliverers; approval of the final lay-out of the yard; soil investigation performance - expert in yard and slipway design - 15 to 30 April 1982.

2. Approval of the construction works; approval of drawings on electrical energy supply; approval of erection works on self made boatyard equipment; start of installation works - expert in yard and slipway design - 1 to 15 January 1983.

3. Preparation, approval and start of the training programme for the boatyard staff-expert in boatbuilding of wooden boats, expert in boat engine installation and repair - 1 to 30 June 1983.

4. Putting into operation of the installed equipment and training of the staff foreseen for its use- expert in building of wooden boats - 1 to 30 January 1984.