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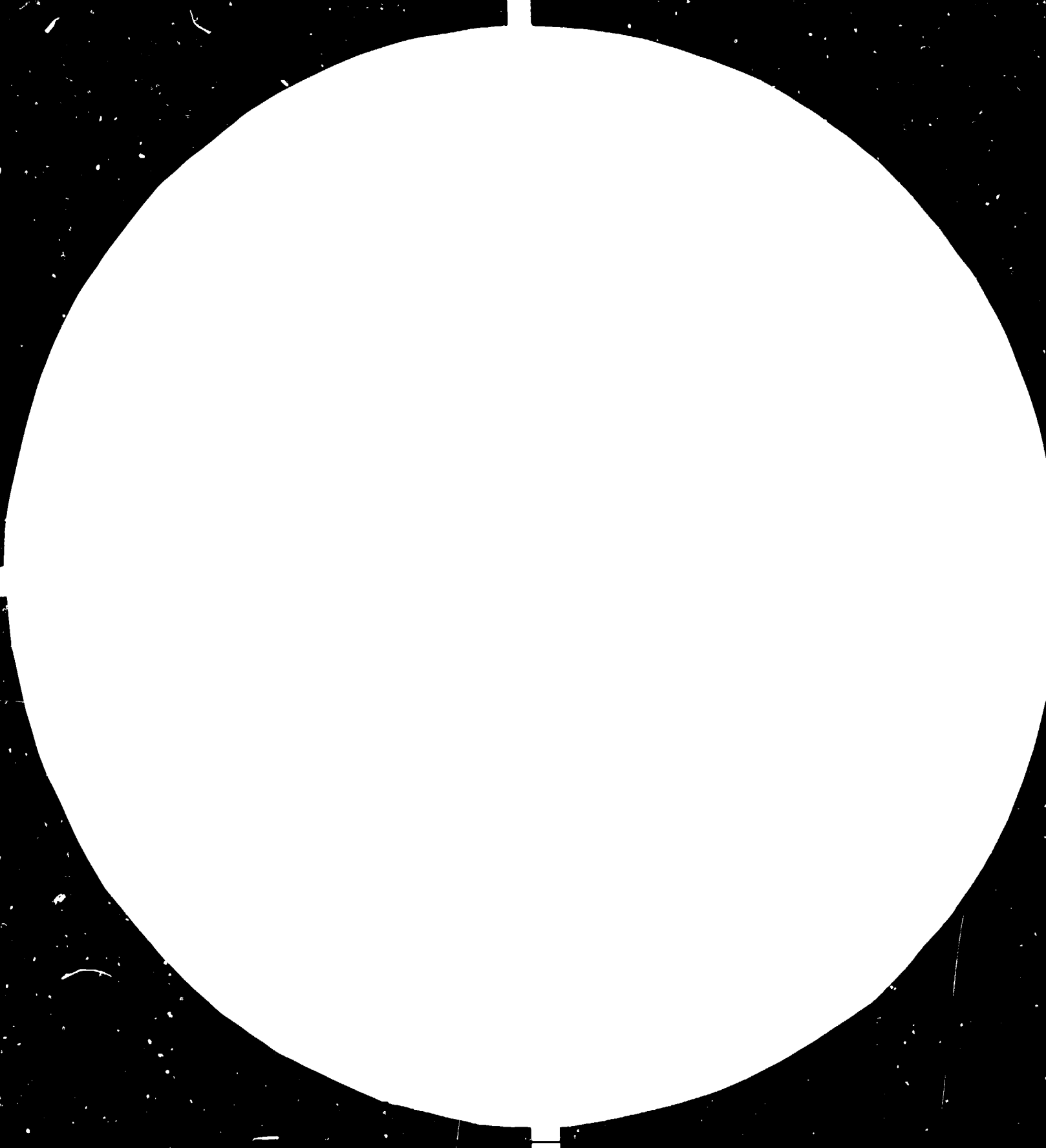
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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

13515

Seychelles  
REPORT ON THE FOURTH MISSION, (Shipbuilding)  
TO THE REPUBLIC OF SEYCHELLES

26 October - 5 November 1983

by

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UF/SEY/80/044/11-02/31.9.D

## I. INTRODUCTION

The fourth 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 establishment of a new Boatyard and Boat Maintenance Complex on the island Praslin. The basic document during this mission has been the Job Description UC/SEY/80/244/11-02/31.9.D which listed all duties connected with the position of the consultant in yard and slipway design.

The present mission is the continuation of the three previous which took place: first between 24th January and 14th February 1982, second between 12th and 27th April 1982 and third between 21st October and 2nd November 1982.

The present mission period combined the briefing at UNIDO Headquarters 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: 26th October to 18th October 1983.

Stay on Mahe and Praslin, Seychelles: 28th October to 4th November 1983.

Travel from Victoria, Mahe, Seychelles to Gdynia, Poland: 4th November to 5th November 1983.

The results of the fourth mission are generally described in Chapters II, III and IV.

## II. GENERAL DESCRIPTION OF THE OUTCOME OF THE MISSION

The main task of the fourth mission was to check the stage of construction works at the site on Praslin as well as the fulfilment of the previous statements concerning the establishment of the Boatyard on Praslin.

During the third mission new dimensions of boats to be built at the boatyard in Praslin were settled. However, in the meantime, the dimensions presented in the report from the first mission have been finally accepted as the main dimensions for the yard into consideration. Thus also the training of Mr Poupouneau (Production Engineer) as well as the design made by Mr Tarnacki (Expert in Boat and Equipment Design) concerned the 6.3 m long boat, introduced during the first mission.

Taking the above statement into consideration all the following considerations will concern boat of the length from 6.3 to 11.7 m.

During the fourth mission meetings were held with the Minister of Planning and External Relations, Dr J.D.M. Ferrari, Chief Engineer of the Technical Division of the Ministry of Planning and External Relations (responsible for the whole project) Mr Alan Lloyd, Graduate Engineer at this Division Mr Marc D'Offay (responsible for the structural project) and Economic Cooperation Officer at the Ministry of Planning and External Relations Mr Edouard C. Gendron. During discussions with the above mentioned representatives of the Ministry of Planning and External Relations the final production programme as well as the technological lay-out and general lay-out of the boat building and boat repair yard have been accepted. Thus the design and construction works of the boat building and boat repair hall may proceed without formal questions or difficulties.

In the report from the second mission a revised time schedule was presented. Concerning the fulfilment of this time schedule following can be stated:

Ad p. 1 The purchasing of the parcel at island Praslin is done.

Ad p. 2, 11, 14 The orders for the equipment to be purchased in 1982 have been done. Following equipment is still not ordered, namely, universal miling machine, guillotine shears, boring and miling machine, hand hydraulic pipe bender, launching - docking winch of 5 metric tonnes capacity with a rope 22 m dia and length of 100.0 m and rapid wood-drier under continuous vacuum. The final decision concerning purchasing of these pieces of equipment will be made after checking the financial situation at UNIDO Headquarters. In any case due to the revision of the general production programme (boats up to 12.0 m long) the following pieces of equipment listed in the report from the third mission have to be cancelled, namely, guillotine shears, boring and miling machine, hand hydraulic pipe bender and the rapid wood-drier. The launching-docking winch may be of smaller capacity whilst instead of the boring-miling machine a boring machine should be purchased.

Ad p. 3 No documents concerning soil investigations and sea bottom level measurement have been delivered. However, the proposed new general lay-out of the boat-yard take into consideration the areas where rock create the substrata what means that a proper foundation of the boat building and boat repair hall is possible.

Ad p. 4,5,6,7,12,13 After introduction as final programme the statements of this report, the preparation of the final layout of the boatyard, of the structural calculations and detail drawings of the boatyard hall and slipway, as well as detail drawings of the water supply and sanitary systems will be possible. Concerning the detail drawings of the electrical energy supply system a proposal is made to collect the detail requirements presented by the equipment deliverers and on basis of these informations to prepare the necessary drawings. An assistance of a specialist in this field is very appreciated. Thus a suggestion will be prepared after return from this mission and mailed to the Technical Division.

Ad p. 8 The cleaning of the site etc. started. However, the preparation of the whole area (levelling, reclaiming, etc) for starting of construction works is still not finished.

Ad p. 9, 15 The construction and installation works have not been started until now.

Ad p. 10, 18 The training of the production engineer started and will be finished at the end of the year 1983.

Ad p. 16,19,20,21,22 In connection with the situation at the site these points have to be the subject of a new time schedule taking into consideration the fulfilment of points 4,5,6,7,12 and 13. It seems that a reasonable date of finishing of all construction works is the end of March 1984. Thus the start of the work of the Shipbuilding Expert-Project Coordinator could be possible from the 1 April 1984. However due to all events which took place until now, a revised job description for the Shipbuilding Expert is necessary. It should be suggested that the Project Coordinator would be also responsible for the installation and putting into operation of all the equipment purchased for the boatyard. Thus also the final electrical energy supply system should be approved by the Project Coordinator.

Taking into consideration the above statements it is necessary to revise the budget mainly from the point of view of the new time schedule. Some changes in the distribution of the total sum available, may also be taken into consideration.

### III. GENERAL PROGRAMME AND BASIC LAY-OUTS

Due to some financial problems (shortage of financial resources) and following the National Development Plan 1982-86 the general programme and basic lay-outs of the boatyard and boat maintenance complex must be considerably changed in relation to the programmes and lay-outs presented in reports from the three previous missions. However, the programme and the basic lay-outs presented in this report have to be treated as final, although the influence of the previous programmes is here visible.

#### 1. PURPOSE OF THE BOATYARD

Building and maintenance of wooden fishing boats.

#### 2. OUTPUT OF THE BOATYARD

Building of 10 to 12 fishing boats 12 m long yearly or equivalent. Maintenance and repair of the built boats in amount equal to yearly productions.

#### 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 at 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

Taking into consideration the in point 3 defined dimensions of boats and a distance between structural supports of the hall structure equal to 6.0 m as well as the financial limitations, it is proposed to construct a hall of the length between axes of outer supports equal to  $5 \times 6.0 = 30.0$  m. Assuming this length as the total length of the production line and introducing a minimum space between the ships under construction or repair equal to 1.2 m and between the ship and wall 0.6 m the following minimum number of boats may be simultaneously constructed or repaired:

Pot fishing boats	4	2	-
Shallow draft handliners/trollers	-	1	2
Total number of boats	4	3	2
Total minimum length of the production line, m	30.0	27.9	25.8

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 <sup>2</sup>	Separate room necessary
General Manager	1	6	+
Deputy Manager (Production engineer, boat designer)	1	6	}
Draftsman for deputy manager	1	6	
Administration and 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	15	
Welders - caulkers - splicers	2	20	
Painter	1	15	
Tool and equipment storekeeper	1	-	in the store
Driver	1	-	not necessary
TOTAL	31		

6. DIMENSIONS OF THE BUILDING AND REPAIR SHOPS

6.1 Carpenter Shop

Length: 30.0 m

Width:

(a) Distance between the axis of the production line and between the hall structure face:  $0.5 \text{ beam of the boat} + 1.2 \text{ m} = 0.5 \times 3.73 + 1.2 \text{ m} \cong 3.1 \text{ m}$ .

(b) Total width of the boatbuilding or repair area =  $2 \times 3.1 \text{ m} = 6.2 \text{ m}$ .

(c) Total width of the carpenter working area:  $220 \text{ m}^2$   
(necessary area):  $30.0 \text{ (length)} = 7.33 \text{ m}$ .

(d) Distance between structural columns (preliminary height of a hall support cross-section =  $0.6 \text{ m}$  and  $0.5 \text{ m}$ )  
 $\cong 6.2 + 7.33 + 0.3 - 0.1 \cong 13.73 \text{ m}$ . For simplicity reason assumed  $13.5 \text{ m}$ .

Total carpenter shop area  $\cong (6.2 + 7.33 + 0.45 + 0.10 - 0.23) \times 30.0 \cong 412.5 \text{ m}^2$ .

6.2 Outfitting and Repair Shop

Total necessary area:  $210 \text{ m}^2$

Distance between the axis of the structural supports (proposed) =  $9.0 \text{ m}$ .

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 =  $9.0 + 0.1 - 0.3 = 8.8 \text{ m}$ .

Total length =  $210.0 : 8.8 = 24.0 \text{ m}$  (four fields of  $6 \text{ m}$ ).

6.3 Store for tools and equipment

An area of about 10% of the total production area of the hall ( $413 + 210 - 373.30 \cong 511 \text{ m}^2$ ) is assumed i.e. about  $51 \text{ m}^2$ .

Total length =  $510 : 8.8 = 5.8 \text{ m}$  (one field of  $6 \text{ m}$ ).

6.4 Assumed general dimensions

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

7. NECESSARY DIMENSIONS OF THE OFFICE AND REST ROOMS

7.1 Offices

Total necessary area: 30 m<sup>2</sup>

7.2 Rest Rooms

Total number of employees = 31

Necessary rest rooms area: 31 x 0.8 = 25 m<sup>2</sup>

7.3 Total area

Total area required: 55 m<sup>2</sup>

8. LOCATION OF THE BOATYARD

According to the final decisions following parcels are available for location of the boatyard, namely (Fig. 3):

Parcel PR 567 of 1708 m<sup>2</sup> land area

Parcel PR 759 of 1319 m<sup>2</sup> land area

This means that the total available land area is at the time being 3072 m<sup>2</sup>. It can be divided as follows:

Boatbuilding and repair hall area	=	700 m <sup>2</sup>
Timber seasoning and storage area	=	800 m <sup>2</sup>
Launching and boat repair area	=	600 m <sup>2</sup>
Roads, parkings and inside communication area	=	400 m <sup>2</sup>
Outfitting storage area	=	500 m <sup>2</sup>
Office and rest room building	=	70 m <sup>2</sup>
Total	=	<u>3070 m<sup>2</sup></u>

A general layout of the boatyard for this area (Fig. 4) taking into consideration the general soil conditions indicates that a reliable production line may be reached, whilst the slipway would be in this case on the direction 68°.

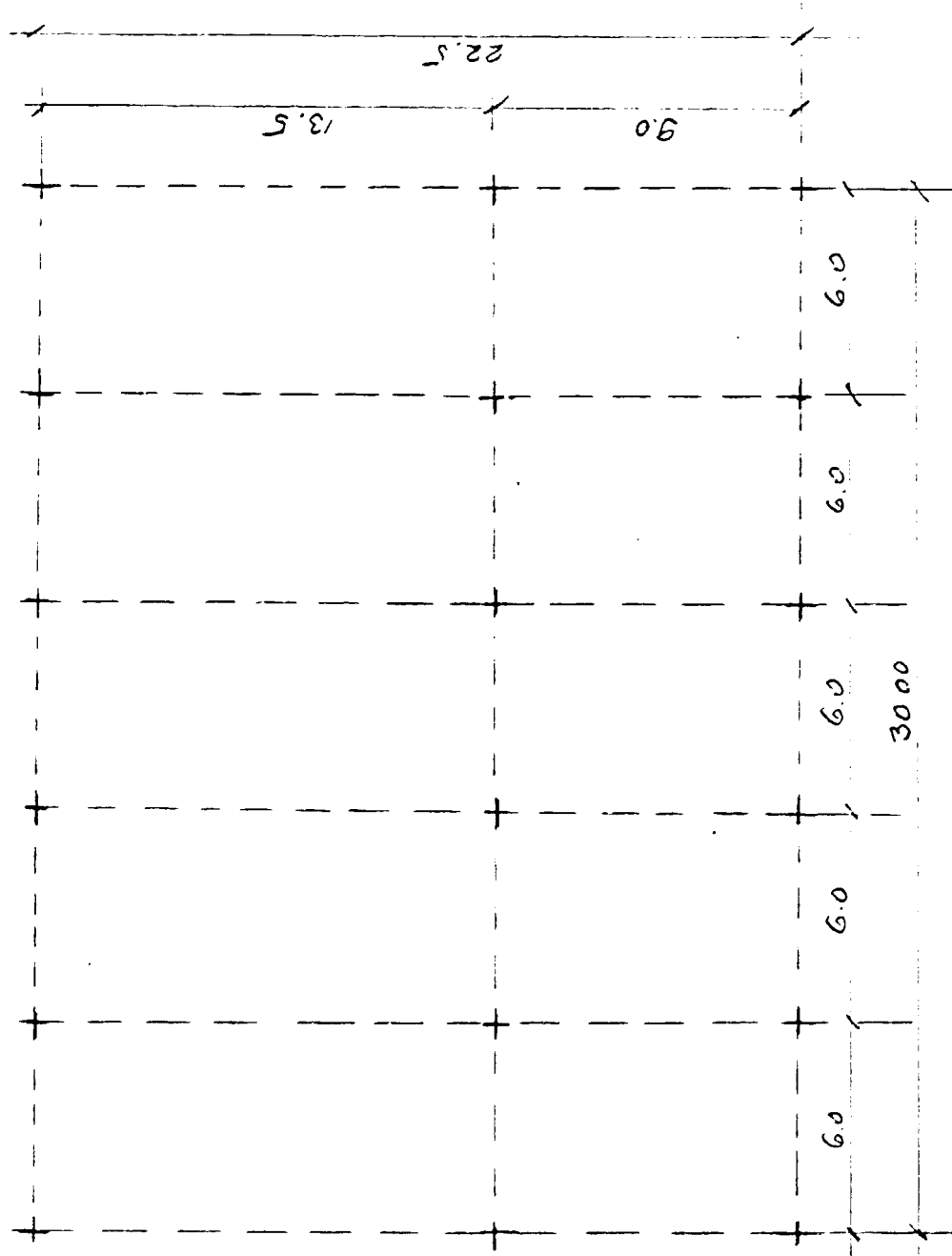


Fig. 1. LAYOUT OF SUPPORTS OF THE BOAT-BUILDING AND REPAIR HALL

ASSUMED DIMENSIONS:

WALL THICKNESS:  $0.15\text{m} = b$   
 HALL SUPPORTS:  $0.30 \times 0.60\text{m} = a \times h'$   
 $0.30 \times 0.50\text{m} = a \times h''$

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

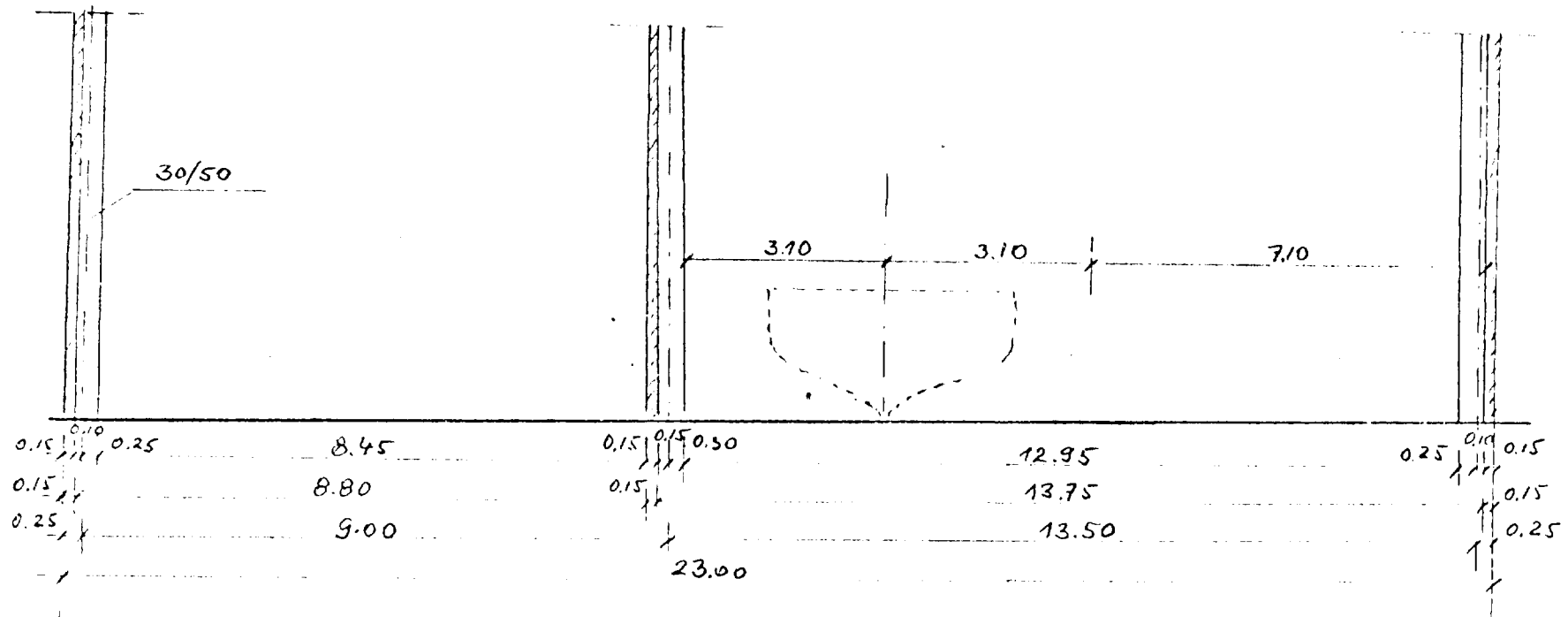


Fig. 2 ASSUMED OVERALL DIMENSIONS OF THE HALL CROSS SECTION



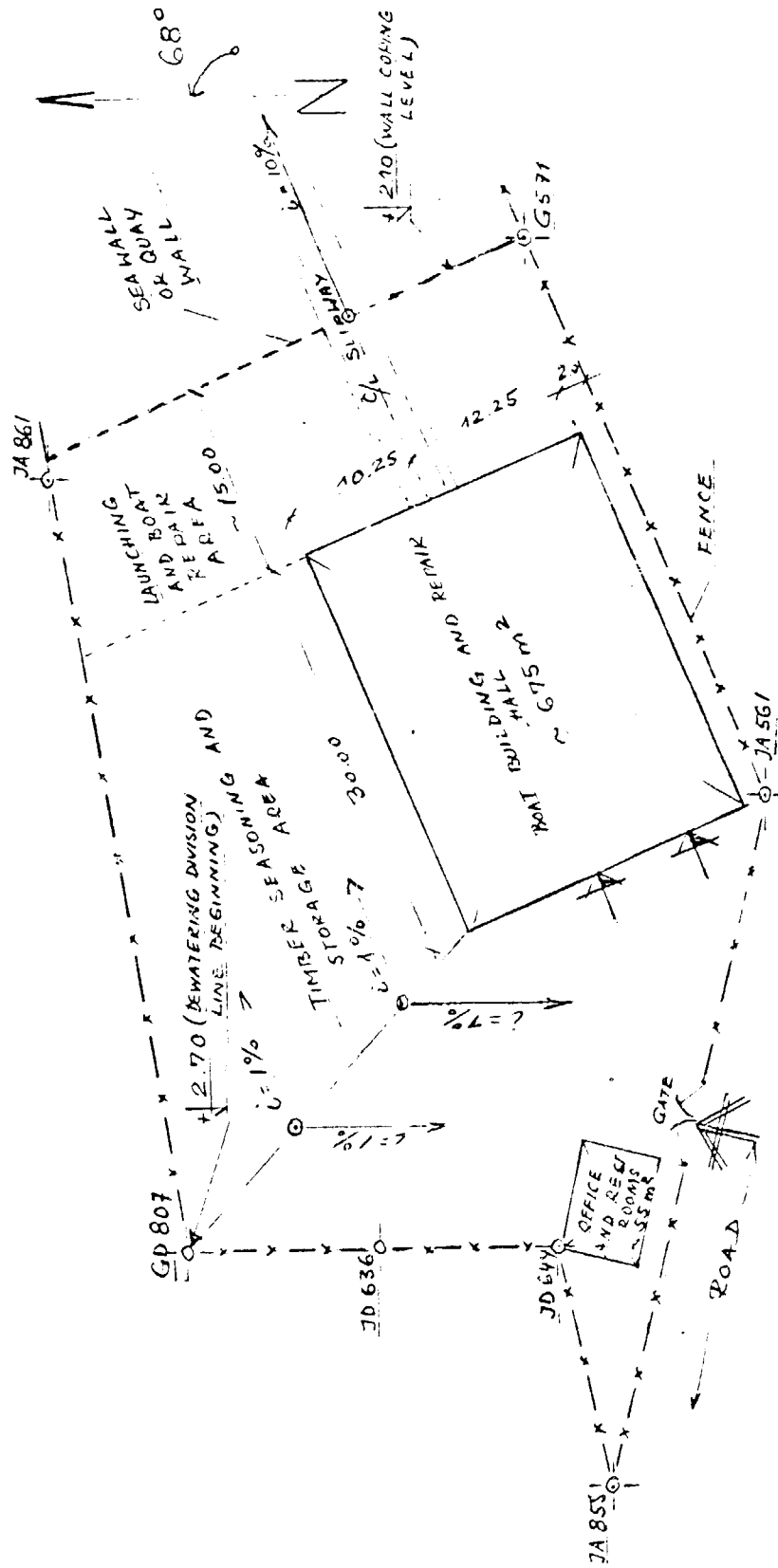


Fig. 4. GENERAL LAY-OUT OF THE BOAT BUILDING AND BOAT REPAIR YARD



The boatyard area has to be properly dewatered. First an inclination towards the sea wall and towards the road of about 1% has to be made. Secondly, because of a water collection area in the North-West of the parcel a drainage system of this area has to be installed. This drainage may consist of a trench made to the mean low water level (+0.30 m) and filled with gravel and macadam. This drainage has to be done before the levelling of the whole area will take place.

Taking into consideration the available land area it shall be pointed out that it is possible to erect an outfitting quay of the length equal to the width of the available parcel minus the width of the slipway. This would allow also to increase the available land area.

In relation to the statements made in the reports from the first and second mission a general change concerns the lay-out of the office and rest rooms. It is now proposed to place these rooms in a separate building located near the entrance gate to the boatyard. This should allow to decrease significantly the costs for that part of the yard. Also the necessary area is reduced from about 100 to 55 m<sup>2</sup>. The lay-out of this building can be similar to proposed by the Technical Division in the preliminary design of the construction of the boatbuilding and repair hall.

#### 9. LAUNCHING - DOCKING FACILITY

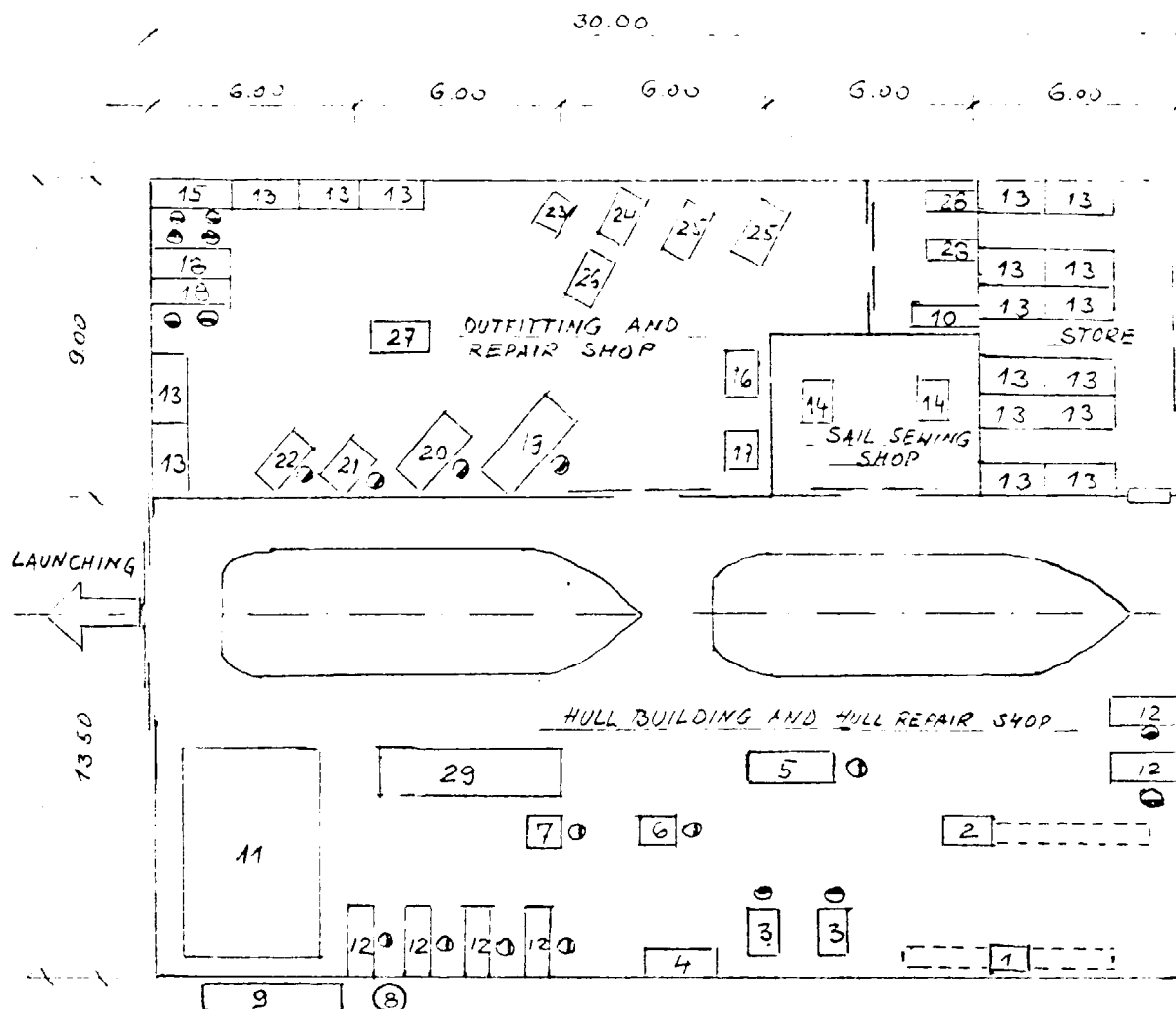
For launching and docking of boats up to the length 11.7 m a longitudinal slipway with cradles of tyred wheels has been chosen. The slipway structure shall be made according to Fig. 10 from the report of the first mission, whilst the transportation and launching cradle is constructed at a yard in Poland and will be delivered at the end of this year. This cradle however, suits boats of the length of 6.3 m. Thus for the longer boats a new one has to be designed using the winch and ropes being a part of equipment of the yard. It should be <sup>here mentioned that the yard will be</sup> equipped with a mobile crane of 80 kN lifting capacity which will allow to lift from water and launch of all boats of this weight.

10. BOATYARD BASIC EQUIPMENT

The following final list of equipment is proposed for the boatbuilding and boat repair yard. The proposal of the technological lay-out of the equipment in different workshops is presented on Fig. 5.

10.1 Hull building and hull repair workshop

1. Cross-cutting circular saw	1 pc
2. Pendulum circular saw	1 pc
3. Circular saw with tilting blade	1 pc
4. Band saw (wheel dia 600 mm and 800 mm)	2 pcs
5. Planing machine (up to 400 x 20 mm)	1 pc
6. Thicknessing machine (up to 250 x 630 mm)	1 pc
7. Down spindle wood moulding machine (max cutter dia 100 mm, table 900 x 1100 mm)	1 pc
8. Carpenter bench of dimensions 2.0 x 0.7 m	6 pcs
9. Mould loft floor of dimensions 4.0 x 6.0 m	1 pc
10. Steam generator (fuel oil heated)	1 pc
11. Cylinder steam bath (0.6 m dia, 6.0 m long, pressure 50 kPa)	1 pc
12. Hand-operated electrical polishing machine	6 pcs
13. Portable electrical circular saw	5 pcs
14. Portable electrical drill (with support)	2 pcs
15. Portable electrical router	4 pcs
16. Portable electrical bench plane	2 pcs
17. Portable chain saw	2 pcs
18. Hand operated hoisting tackle (0.5 metric ton capacity)	3 pcs
19. Monorail hand-operated hoisting tackle (1.0 metric ton capacity)	3 pcs
20. Hull caulking (tightening) tools	1 set
21. Painting tools	2 sets
22. Carpenter tools	6 sets
23. Hand-mechanical jack (5 metric tons capacity)	4 pcs
24. Work bench for gluing of frames and keel line members	1 pc



1. Cross-cutting circular saw, 2. Circular saw with tilting blade,
3. Band saw, 4. Pendulum circular saw, 5. Planing machine, 6. Thicknessing machine, 7. Down spindle moulding machine, 8. Steam generator, 9. Cylinder steam bath, 10. Gas welding and cutting equipment, 11. Mould loft floor,
12. Carpenter bench, 13. Backs, 14. Sails sewing machine, 15. Electrician's table, 16. Sheet metal bench shears, 17. Hand lever shear, 18. Fitter's table,
19. Universal lathe, 20. Universal milling machine, 21. Universal sharpener for tools, 22. Sharpening machine for handsaw, 23. Planing cutter grinding machine, 24. Hand operated hydraulic press, 25. Wack saw, 26. Hand-hydraulic pipe bender, 27. Movable electrocompressor, 28. Electrical welding, 29. Work bench for gluing of frames and keel-line members.

Fig 5. TECHNOLOGICAL LAY-OUT OF THE YARD

10.2 Outfitting and repair shop

1. Sheet metal bench shears	1 pc
2. Hand lever shear	1 pc
3. Boring machine	1 pc
4. Universal lathe ( $\phi = 1500$ mm)	1 pc
5. Universal milling machine	1 pc
6. Universal sharpener for tools	1 pc
7. Band saw and circular saw blade sharpening machine	1 pc
8. Planing cutter grinding machine	1 pc
9. Hand-operated hydraulic press (50 metric ton capacity)	1 pc
10. Hack saw (up to 500 mm dia)	2 pcs
11. Static three-phase welding rectifier with welding equipment	2 sets
12. Gas welding and cutting equipment	1 set
13. Hydraulic jack (2 metric ton capacity)	1 pc
14. Wheel-mounted electrocompressor	1 pc
15. Racks (2.0 x 1.0 x 0.5 m with 5 shelves)	5 pcs
16. Fitter's and electrician's table (with 2 stands and dimensions: 2.0 x 0.7 m)	3 pcs
17. Hand-operated hoisting tackle (1 metric ton capacity)	2 pcs
18. Locksmith tools	2 sets
19. Electrician tools	2 sets
20. Appliance for cold rolled stainless steel terminals	1 pc
21. Clamps for ropes	2 pcs

10.3 Store

1. Racks (2.0 x 1.0 x 0.5 m with 5 shelves)	12 pcs
2. Pulley block	2 pcs
3. Hand-industrial track	2 pcs
4. Mobile crane (8 metric ton capacity)	1 pc
5. Forklift truck (2.5 metric ton capacity)	1 pc
6. Sail's sewing machine	2 pcs

10.4 Launching - docking equipment

1. Transportation and launching cradle	1 pc
2. Launching - docking winch of 2 metric ton capacity with a rope 12 mm dia and length of 70.0 m	1 set

11. STRUCTURAL SOLUTION OF THE BOATBUILDING AND REPAIR HALL

The structural solution of the boatbuilding and repair hall was the subject of very wide discussion in reports from the first and second mission. Several propositions have been made in the reports (e.g. Fig. 12, 13, 14 in the report from the first mission and Fig. 6 in the report from the second mission) and by the Technical Division (Fig. 3 in the report from the second mission and drawings No. MFER TD B.Y. 1c and 1d of the preliminary project of the boatyard). However, it is still necessary to perform all statistical calculations which will prove the need of trusses and columns of the proposed dimensions and will prove the stability of the hall in the longitudinal and transverse directions. In addition these calculations should indicate if a simpler structural solution of roof trusses as well as columns and walls is not possible taking into consideration the preliminary project of the Technical Division. It is here necessary also from the financial point of view to repeat the recommendations given in the report from the second mission, namely:

- (a) The outside columns of the 9.0 m bay may be cancelled whilst the roof trusses may be laid directly on the concrete block wall. The block wall at the trusses axes may be thickened in the form of plasters. This will save not only concrete columns but also column bases.
- (b) The height of the roof trusses may be reduced taking into consideration the fact that the allowable height may be  $\frac{1}{11}$  to  $\frac{1}{11}$  of the span. Thus the height of the truss for the span of 9.0 m may be of about 1.0 m, and the height of the truss for the span of 13.5 m of about 1.5 m. This will allow to reduce considerably the height of the middle row columns which in any case may end at the truss support level. The timber louvres for ventilation will be placed at the height created by the difference of the top levels of the two trusses.
- (c) It seems possible to erect the wall between the two bays as wall from wooden planks nailed to wooden frames. This would allow to cancel the heavy concrete block wall with its foundation. It is not recommended to cancel totally the wall due to a very expensive equipment placed in the outfitting and repair workshop.

Concerning the foundation following remarks have to be raised in addition to statements made in the point concerning the location of the boatyard (similar remarks are presented in report from the second mission):

- (a) Before starting the final foundation calculations it is necessary to accept the floor level above the high tide level. In this report the floor level + 2.10 m for a high tide level + 1.90 m is proposed.
- (b) The high tide level in the vicinity of the yard should be checked to avoid flooding of the boatyard.
- (c) The foundation level ( $\sim 0.3$  m under the ground level) should be compared with the original levels of ground suited to take over loadings from the foundation. Differences between these two levels should be reduced by placing under the foundation base of a lean concrete layer with a proper thickness.
- (d) The final dimensions of the foundation bases have to be determined on the basis of soil investigation made on site after reaching the proper foundation level mainly from the point of view of soil strength parameters as well as from the point of view of settlements of the structure in the operation stage.
- (e) The final drainage system of the whole boatyard area should be decided after investigations showing the ground water levels on the area into consideration and of the connections between the ground water level and sea water level.

Independent on the detail solutions of the structure following heights of the two workshops are recommended:

- (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 fastening of monorail hand-operated hoisting tackle should be provided on the roofing trusses. This should be proved by structural calculations.

It is here recommended that the gable walls above the level + 3.50 m for the lower part of the hall and above the level + 6.30 m for the higher part of the hall have to be made as wooden planking.

#### IV. CLOSING REMARKS

The statements and remarks presented in this report should allow to prepare the final designs and structural drawings connected with construction of the boatbuilding and boat repair hall as well as with the building for office and rest rooms. Of course the statements of this report should be taken into consideration together with statements from the three previous missions.

Considering the until now existing progress of works connected with establishment of the boatyard it seems reasonable to assume that the construction works may be ready at the end of March 1984. This means that the appointment of the Project Coordinator should be prepared so that he could start the work from 1st April 1984. Taking into consideration the fact that the person who has prepared the design of the boat 6.3 m long as well as trained Mr Pouponneau in Poland was Mr B. Tarnacki from Poland, it is suggested to appoint him on this post.

Concerning the equipment ordered until now it has to be stated that this equipment delivered to Seychelles is stored in a warehouse in the harbour of Victoria. In connection with this it is suggested to appoint as soon as possible a person responsible for taking care of this equipment to avoid its deterioration.

In addition it is suggested that this equipment should be delivered as soon as possible to Praslin and stored in a temporary warehouse built on the land area foreseen for the boatyard (in the North-West corner). This would allow to perform the installation works in a proper way as well as a continuous supervision by the manager of the boatyard.



