
AID Washington
USAID Somalia

Contract Number AFR 0114-C-00-4005-00
Project Number 649-0114

Somali Democratic Republic
Kismayo Port Rehabilitation

Port Maintenance Study Report

Parsons Brinckerhoff International, Inc.
Mogadishu, Somalia
New York, New York

May 1984

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AID WASHINGTON

USAID SOMALIA

Contract Number AFR-0114-C-00-4005-00

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PORT MAINTENANCE STUDY REPORT
KISMAYO PORT REHABILITATION
THE SOMALI DEMOCRATIC REPUBLIC

PARSONS BRINCKERHOFF INTERNATIONAL, INC.

MOGADISHU, SOMALIA

NEW YORK, NEW YORK

MAY 1984

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Parsons Brinckerhoff

Parsons Brinckerhoff International, Inc. Engineers • Architects • Planners

June 28, 1984

Mr. J. Villafane
Chief, Office of Engineering
USAID/Somalia
Mogadishu

Re: USAID Project No. 649-0114
Kismayo Port Rehabilitation
USAID Contract No. AFR-0114-C-00-4005-01
Port Maintenance Study Report

Dear Mr. Villafane:

We are pleased to submit the final report on the Port Maintenance Study performed in accordance with the Scope of Work as stated in Article I.B.5 of our Agreement. This work was authorized by letter from USAID/Somalia dated November 30, 1983.

A draft report was submitted in Mogadishu on April 9, 1984 and comments received in New York in early May. Mr. Issa Abdi, Director of Planning, Ministry of Public Works reviewed the draft report in New York. Additional comments from AID/Washington were received in early June. This final report has been expanded considerably in response to the comments received.

The Contract Documents for the Kismayo Port Rehabilitation include, as Optional Items, the execution of the training programs for equipment and civil/structural maintenance personnel. The P.B.I. proposal for Technical Inspection of Construction services includes the execution of the Maintenance management personnel training program and the supervision of the other two programs.

The need for improved maintenance at the Kismayo Port is critical to the efficient long-term operation of the port. The implementation of the suggestions of this report are a necessary step toward achieving this improvement.

The preparation of this report was greatly aided by the cooperation of the Somalia Ports Authority and the Kismayo Port Director.

Very truly yours,
PARSONS BRINCKERHOFF INTERNATIONAL, INC.

Warren M. Buser

Warren M. Buser
Project Manager
WMB/jal

Mailing Address

One Penn Plaza, 250 West 34th Street • New York, New York 10119
212-613-5000 • Cable: Parklap, New York • Telex WU12-5441 • RCA 232 117

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PORT MAINTENANCE STUDY
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EXECUTIVE SUMMARY

Existing Maintenance Organization and Situation

Kismayo Port assets are in poor condition (see Section 2). Much of the cargo-handling equipment is either disabled or operating at low efficiency and in need of repair. There is presently no preventive maintenance program, and maintenance facilities are inadequately equipped. Maintenance activities consist mostly of repairs of equipment on breakdown, which usually results in the equipment's lying in the open yard for months waiting for replacement parts. During such delays, the marine environment further deteriorates the disabled equipment. Maintenance of civil works is also lacking.

Proposed Maintenance Organization at Kismayo Port

In 1977, the management consultants Price Waterhouse Associates drew up a proposed overall maintenance organization for the whole Somali ports system (Figure 2-1), together with proposed procedures for planned maintenance, including ordering and replenishment of spare parts stocks centralized at the Somali Ports Authority (SPA) headquarters. The present report, by Parsons Brinckerhoff International (PBI), concurs and presents information to assist in implementing the Price Waterhouse recommendations. In response to the Price Waterhouse study, the Somali Ports Authority (SPA) is now in the process of setting up a Central Engineering Section in Mogadishu and assigning maintenance supervisors to Somali ports, including Kismayo.

In line with these actions of the SPA, the present report (Section 3) proposes an organization arrangement for Kismayo Port's maintenance unit, including an organization chart and staffing pattern (Figure 3-1), to form a new Maintenance and Engineering Service (see Section 3). This Service would be separate from the port operations unit and report to the Assistant Port Manager. This maintenance unit is in line with and complements the overall maintenance organization proposed by Price Waterhouse.

The port already has many of the skilled maintenance workers needed. A maintenance supervisor should be hired by SPA and appointed to Kismayo Port as soon as possible. This individual will head the proposed maintenance unit. The office of the new Service will need four new clerical and other workers for parts requisitioning, record-keeping, and other elements of the planned maintenance program. They could be hired in Kismayo. Three skilled maintenance workers are also needed (an electrician and two mechanics), making a total of eight new hires (see Table 3-1 for more detail):

- o Supervisor
- o Clerk
- o Clerk/typist
- o Messenger for office
- o Driver for office
- o Electrician
- o Two mechanics.

The addition of these eight will bring the maintenance personnel of Kismayo Port to 39, with an annual salary budget of 472,800 Somali shillings, including the Service head's salary.

At least one person in the Civil/Structural Section should be trained to use scuba diving equipment to perform underwater inspection and maintenance.

In addition to separating and reorganizing the maintenance unit, currently part of the operating unit, this report recommends moving the automotive service section of the maintenance workshop to the existing maintenance shed located within the port compound at the back of Berth 3 (Figure 2-3). The move is recommended to carry out on-site daily maintenance of the mobile equipment, and the maintenance equipment involved in the move will include portable greasing/lubricating equipment, a mobile garage jack, a garage compressor, a battery charger, and hand tools. The cost of moving the automotive service section into the port compound using in-house labor is estimated at \$500 (Table 2-1).

Training Program for Maintenance Personnel

A training program should be implemented to provide the maintenance personnel with necessary knowhow to effectively fulfill the various maintenance functions. The training program proposed in this report (Section 4 and Appendices B-D) consists of three courses timed to correspond with the construction of Berths 1 and 2:

1. Management course for maintenance management personnel (January 1986; 9 trainees, including the 3 engineers of the SPA Central Engineering Section, the maintenance supervisors at the Ports of Kismayo, Mogadishu, and Berbera, and 3 other trainees).

2. Equipment maintenance course for the foreman and skilled workers of the Mechanical/Electrical Section at Kismayo and other ports (February 1986; 20 trainees, including 10 from Kismayo and 5 each from Mogadishu and Berbera).

3. Civil/structural maintenance course for the foreman and skilled workers of the Civil/Structural Section at Kismayo and other ports (February 1986; 15 trainees, 5 from each port).

Each of these courses combines classroom instruction with on-the-job training planned in conjunction with the activities of the port rehabilitation construction contractor. The direct instructional costs for the three courses (excluding such things as providing classrooms, living allowances and trainees wages) total \$146,000 (Tables 4-1 and 4-2). The report recommends that PBI conduct the management course and supervise the two courses for skilled workers, which will be conducted by the construction contractor.

Anticipated Need and Cost for Replacing and Adding Cargo-Handling and Maintenance Equipment

Kismayo Port has many pieces of both cargo-handling and maintenance equipment that are either nonrepairable or approaching the end of their expected 8-10-year lifetimes. Although some can be decommissioned without

replacement, most will need replacement in either 1985 or 1988, and additional equipment is recommended for purchase in 1988, to service the rehabilitated port.

Maintenance equipment should be added, mostly for the automotive service section, and some antiquated machine tools should be replaced, as described in Section 5.2.

Lists of cargo-handling and maintenance equipment recommended for replacement or addition, with estimated costs, are shown at the end of the executive summary.

Financial Plan for Maintenance and Equipment Procurement

A 5-year financial plan was prepared for this report and is intended for budgeting purposes (Table 6-3). It shows capital expenditures falling in two years, 1985 and 1988. The 1985 purchases will include one major piece of cargo-handling equipment and several necessary items of maintenance equipment (total U.S. \$115,000). The much larger 1988 purchases will be entirely for new or replacement cargo-handling equipment (U.S. \$791,000). These capital costs are shown in 1984 U.S. dollars.

Necessary annual funds, including foreign exchange, should be allocated to the port to implement the planned maintenance. The annual maintenance portion of the financial plan includes salaries (stated in Somali shillings), materials, and the establishment and replenishment of a spare parts stock. The cost of materials, some of which can be purchased locally, is divided between U.S. dollars and Somali shillings (SoSh) at the April 1984 exchange

rate of U.S. \$1 = 17.38 Somali shillings. The annual maintenance expenses will rise after major equipment purchases are made in 1988:

- o 1985-87 (before major purchases): US \$240,000 + 834,800 SoSh
- o 1988 (transition year): US \$335,000 + 942,800 SoSh
- o 1989 (after major purchases): US \$343,000 + 942,800 SoSh

Cargo-Handling Equipment

<u>Replacement</u>	<u>Year</u>	<u>Total Cost</u>	<u>Category Totals</u>
o 5-ton mobile crane (8 years old)	1988	\$110,000	
o 12-ton mobile crane (8 years old)	1988	\$150,000	
o 3-ton forklift truck (4 years old)	1988	\$ 40,000	
o 5-ton forklift truck (needs major repair)	<u>1985</u>	\$ 50,000	
o Two farm-type tractors (7 years old)	1988	\$ 60,000	
o Two 8-ton trailers (8 years old, to be replaced by two 10-ton trailers)	1988	\$ 20,000	
o Three 5-ton trailers (8 years old, to be replaced by three 10-ton trailers)	1988	\$ 30,000	
<hr/>			
Total Cargo-Handling Replacement ((\$50,000 in 1985; \$410,000 in 1988))			\$460,000
<u>Addition</u>			
o Four sets of crane pallet forks	<u>1985</u>	\$ 5,000	
o One 23-ton mobile crane	1988	\$200,000	
o One yard tractor for containers	1988	\$ 60,000	
o Three 20-foot container trailers	1988	\$ 36,000	
o One 10-ton forklift truck	1988	\$ 85,000	
<hr/>			
Total Cargo-Handling Addition ((\$5,000 in 1985; \$410,000 in 1988))			\$386,000
<u>Decommission Without Replacement</u>			
o 3-ton mobile crane (nonrepairable)		--	
o 8-ton mobile crane (poor general condition)			--
o 17-ton mobile crane (nonrepairable)		--	
<hr/>			
Total Cost for Cargo-Handling Equipment ((\$55,000 in 1985; \$791,000 in 1988))			\$846,000

Maintenance Equipment

<u>Replacement</u>	<u>Year</u>	<u>Total Cost</u>	<u>Category Totals</u>
o Electric drill (antiquated model)	<u>1985</u>	\$ 5,000	
o Lathe 1.20 m (antiquated model)	<u>1985</u>	\$ 10,000	
Total Maintenance Replacement			\$ 15,000
<u>Addition</u>			
o Bench-mounted electric grinder	<u>1985</u>		
o Mobile garage jack	<u>1985</u>		
o Two automotive chain hoists	<u>1985</u>	\$ 15,000	
o Portable greasing/oiling equipment	<u>1985</u>		
o Garage compressor	<u>1985</u>		
o Air compressor for structural works	<u>1985</u>		
o Air-driven tools	<u>1985</u>	\$ 20,000	
o Hand-operated concrete mixer	<u>1985</u>		
o Scuba diving equipment	<u>1985</u>		
o Pickup truck	<u>1985</u>	\$ 10,000	
Total Maintenance Addition			\$ 45,000
Total Costs for Maintenance Equipment			\$ 60,000
Combined Total for Cargo-Handling and Maintenance Equipment (\$115,000 in 1985; \$791,000 in 1988)			\$906,000

1.0 INTRODUCTION

1.1 GENERAL

Parsons Brinckerhoff International, Inc. (PBI) is under contract to the United States Agency for International Development (USAID) for the Kismayo Port Rehabilitation Design. This contract includes, among other items, the performance of a Port Maintenance Study.

This Port Maintenance Study report has been prepared by PBI's port operations specialist after site visits and consultation with personnel of the Somali Ports Authority (SPA), the Port of Kismayo, USAID/Somalia, and AID/Washington.

1.2 OBJECTIVE AND SCOPE

The objective of this Port Maintenance Study is to prepare a time-phased administrative and financial plan for maintenance at the Port of Kismayo which specifies:

- a) Timing, number, and types of personnel to be trained to maintain the Port
- b) Anticipated need and cost for replacing both cargo-handling and maintenance equipment
- c) Administrative arrangements for maintenance, including organization chart, staffing pattern, and budget requirements
- d) Outline of requirements for on-the-job training destined for equipment operators and personnel involved in maintaining equipment,

structures, roadways, pavements, and utilities at the Port. Portions of this training will be provided by the construction contractor.

The requirements to provide on-the-job training are to be included in the construction contract documents.

1.3 SOURCES OF DATA

The Preliminary Design Report prepared by PBI provides background information on the organization and situation of maintenance at Kismayo Port, the concerns and plans for maintenance of the SPA, and data on existing facilities and those to be provided under the rehabilitation project.

Two memoranda prepared for the SPA by Price Waterhouse Associates (PWA), management consultants, provide information on procedures for maintenance costing, planned maintenance, stores recording, and stock control. These procedures are in the process of being implemented.

To supplement the available data, site visits were made by PBI project staff to visually inspect the existing facilities and equipment, and to obtain other pertinent information from port officials and maintenance personnel both in Kismayo and at SPA headquarters in Mogadishu.

1.4 ORGANIZATION OF THIS REPORT

The Executive Summary has presented the key conclusions and recommendations of this report, followed by the present introductory section, which outlines the background and scope of the report.

Section 2.0 describes the existing maintenance organization, staffing, and facilities at Kismayo Port, and the SPA's present plan on organizational structure.

Section 3.0 covers the organization proposed for the new maintenance unit to be established at Kismayo Port and presents justification for the new hires proposed.

Section 4.0 describes the present training activities of the SPA and the proposed training program for port maintenance.

Section 5.0 analyses the needs for replacing and adding new equipment, and Section 6.0 presents a financial plan for maintenance and equipment acquisition at Kismayo Port.

In order to keep the basic text of the report concise, an inventory of existing operating equipment and outlines of the three proposed training courses are placed in Appendices. The PWA Memorandum on Maintenance Costing and Planned Maintenance is also included in the Appendices.

2.0 EXISTING MAINTENANCE ORGANIZATION AND SITUATION

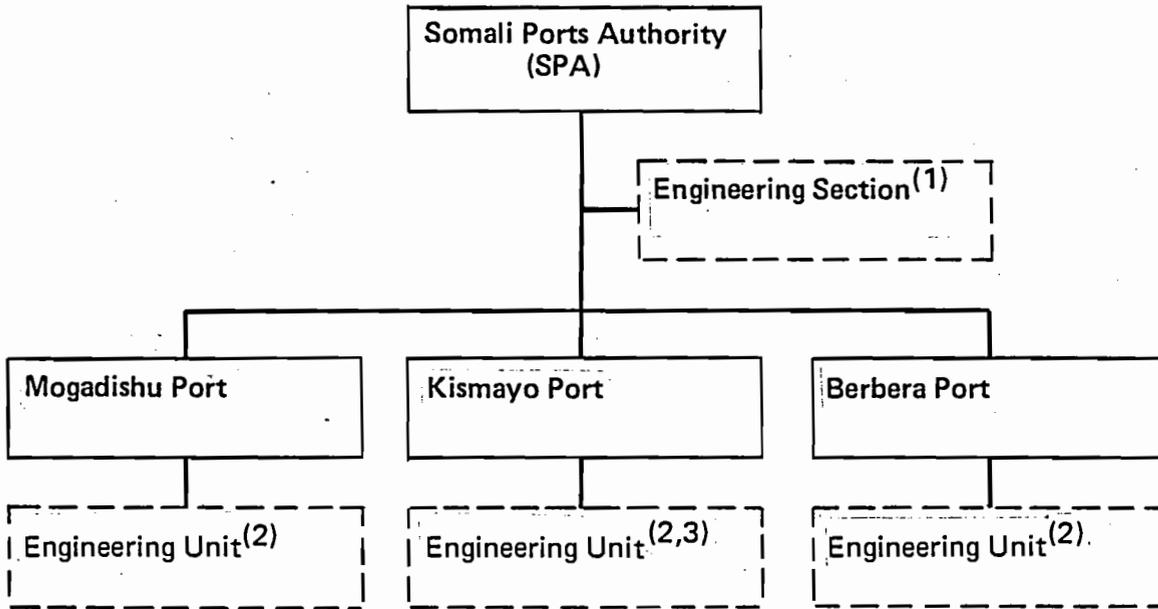
The Somali Ports Authority has overall responsibility for maintenance at Mogadishu, Kismayo, and Berbera Ports (Figure 2-1). At Kismayo the present port facilities consist of the following:

- o the outer armor-stone-protected breakwater
- o the pile-supported concrete deck structure with fendering
- o one mooring dolphin
- o the concrete-paved access roadway and port storage areas
- o two transit sheds
- o one two-story administration building
- o one chilled warehouse
- o one truck scale and scale house
- o miscellaneous buildings
- o product piping and the molasses storage tank facility
- o potable water service
- o an electrical, telephone, and fire protection distribution system
- o a dredged harbor basin and access channel
- o onshore and offshore navigation aids
- o a maintenance workshop
- o cargo-handling equipment consisting of mobile cranes, truck trailers, farm-type tractors, and forklift trucks
- o a hydraulic dredge and supply of floating pipelines.

At this time, the port is without electric service or fire pumps to feed the fire protection lines. The concrete deck structure is in very poor condition, with some sections closed off for safety reasons. The truck scales

Somali Ports Authority Maintenance Overall Organization Chart

Kismayo Port Rehabilitation—Port Maintenance Study



Remarks:

————— Administrative organization

- - - Maintenance organization proposed by Price Waterhouse Associates

(1) In charge of planned maintenance, maintenance inspection and centralized stores.

(2) In charge of maintenance works and spare parts substock.

(3) See Organization Chart proposed for this maintenance unit (Figure 3-1).

are not operative. Most of the navigation aids are not properly positioned and/or are not operative.

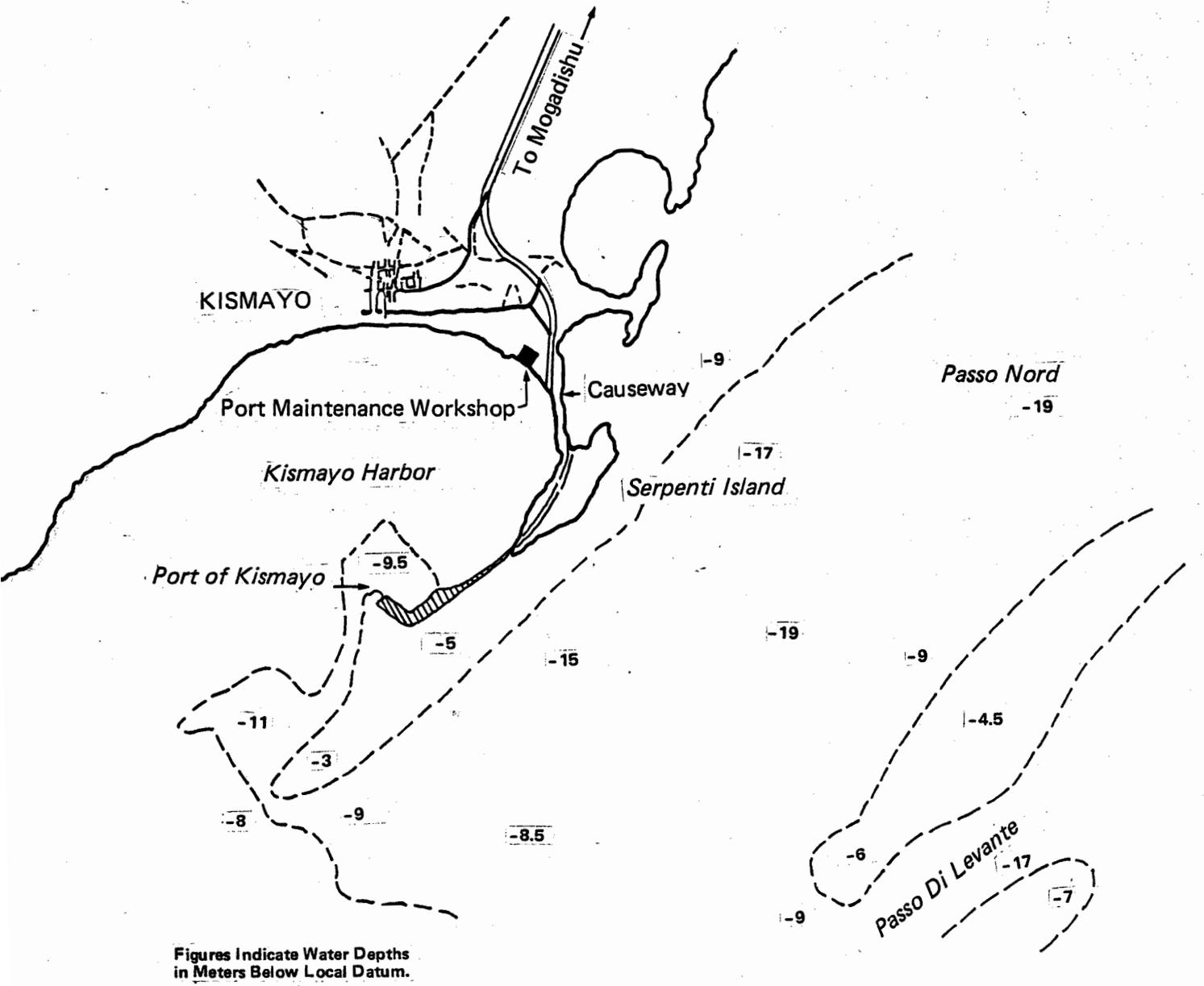
It is apparent from inspection of the port facilities that the present facilities are in urgent need of repair and maintenance. The present Port Rehabilitation Project will replace the deck structure, provide utility services, and replace the navigation aids. These new facilities will require maintenance in the future.

At present there is no separate organizational unit charged with the maintenance of Kismayo Port facilities. The only maintenance facility consists of a workshop belonging to the Operating Service, located at the old port site near the Navy shipyard (Figure 2-2). A small (about 30 square meters) maintenance shed within the port compound (Figure 2-3) is not currently active.

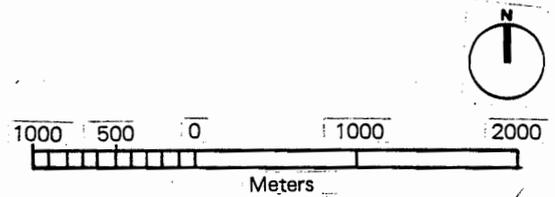
The workshop is manned by ten equipment repair technicians, eight tradesmen for civil engineering repairs, and seven maintenance laborers. The shop equipment consists of:

- o an electric drill of an antiquated model (not operative, due to a broken belt)
- o a lathe of 1.20 m of an antiquated model (out of order)
- o a 42 cm diameter circular saw "MEXAH X" of Russian make (lacking saw blade)
- o a 32 cm diameter circular saw-planer-drill combination machine "OMB - 400 LUX" of Italian make (in good working condition)

Figure 2-2
Location Plan
Existing Maintenance Workshop
 Kismayo Port Rehabilitation—Port Maintenance Study



Figures Indicate Water Depths
 in Meters Below Local Datum.



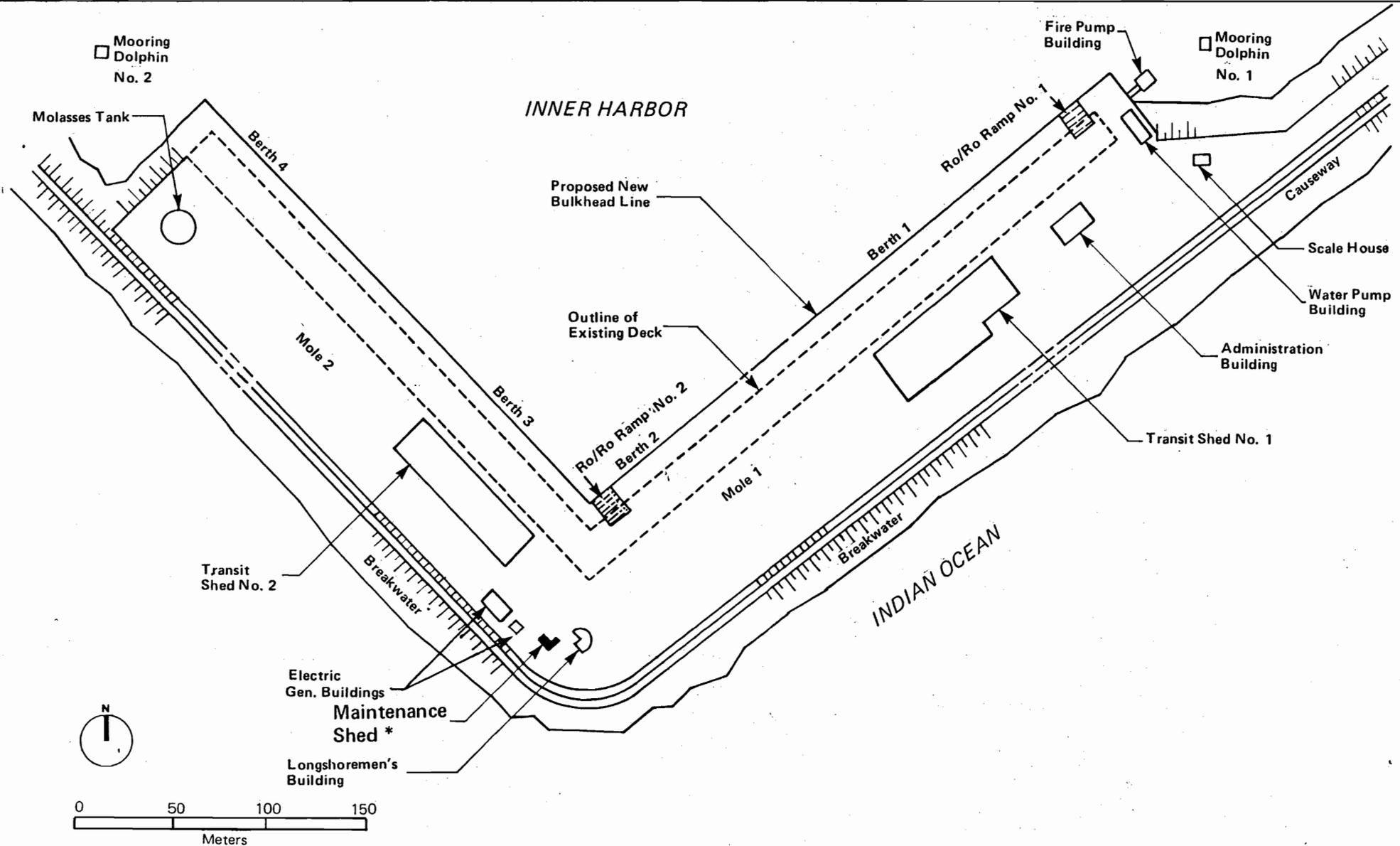
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Figure 2-3

Existing On-Site Maintenance Shed

Kismayo Port Rehabilitation—Port Maintenance Study



*Proposed location for automotive section of maintenance workshop

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- o an AC transformer-type welding machine
- o a diesel-driven welding machine
- o an oxygen-acetylene cutting-welding set
- o a battery charger.

Many pieces of this equipment are old, and replacement parts are hard to find. This equipment is not adequate to maintain the existing cargo-handling and other operating equipment and facilities, and certainly will not be adequate for the rehabilitated port.

The work performed by the shop is mostly repairs of cargo-handling equipment after breakdown, leaving preventive maintenance totally neglected. Log books or operating and maintenance records have not been kept for the cargo-handling equipment. Maintenance of civil works is also lacking. Concrete spalling, cracks, and rust stains are not repaired, cargo door supports are corroded, and roof leaks are not repaired.

The lack of proper maintenance of existing facilities is the result of insufficient funding for maintenance operations and the lack of adequately trained maintenance management personnel. As a result there are no plans for periodic inspection and maintenance, no ordering of spare parts, and no budget for maintenance work.

Most of the workers in the maintenance unit acquired their skill through apprenticeship, are basically capable, but will require training to complement their knowledge with specific knowhow to properly maintain the new facilities to be constructed under the rehabilitation program.

The Somali Ports Authority (SPA) is in the process of implementing the recommendations made in 1977 by Price Waterhouse Associates regarding the organizational and procedural arrangements for maintenance for the whole port system. Their recommended organizational arrangement (Figure 2-1) consisted of a central engineering section at SPA headquarters and separate maintenance units at each port. The central engineering unit will be in charge of planned maintenance, inspection, and centralized stores for all Somali ports. The central stores will be responsible for establishing and reordering stocks of spare parts and stores for all Somali ports. The individual ports will keep a substock of parts and stores requisitioned from the central stores, and purchase only raw materials for civil engineering repairs on the local market. Two of the three required supervising engineers have been assigned to the SPA engineering section. The assignment of the third person is in process.

At the Port of Kismayo it is planned to form a separate maintenance unit in order to carry out more efficiently the port maintenance and repair works. This unit will be headed by a maintenance technician appointed by SPA, who will report directly to the Assistant Port Manager. At the time of writing, this appointment has not been made, although similar positions at Mogadishu and Berbera ports have been filled. SPA is in the process of recruiting this technician through the Ministry of Education.

3.0 PROPOSED MAINTENANCE ORGANIZATION
AND MAINTENANCE FACILITIES AT KISMAYO PORT

3.1 GENERAL

The role of the port maintenance unit is to ensure the full availability of port facilities for operation at its optimum performance to enhance the port's competitive position. Although the necessity of an effective maintenance unit seems obvious, it is often overlooked or neglected in actual practice. To efficiently perform its functions, the maintenance unit should be organized, staffed, and equipped in accordance with port-specific factors, i.e. the size of the port, the nature of its structures and equipment, the type of operation (operating or "landlord" port), the type of cargo, the port's geographical location, and its policy on maintenance (share between "in house" and contract work). Within the overall port organization, the maintenance unit should report directly to a level of management high enough to ensure a proper implementation of its planned activities.

The SPA's concept of creating a separate maintenance unit at Kismayo Port reporting directly to the Assistant Port Manager is adequate and should be implemented as soon as possible. The unit's organizational structure and staffing pattern should fit with the functions and tasks expected to be performed, as will be discussed in the remainder of this section.

3.2 FUNCTIONS OF THE MAINTENANCE UNIT

The Port of Kismayo, like other ports in Somalia, is an operating port. The port agency provides and maintains facilities for the accommodation of ships and the handling of cargo, except for a number of specialized facilities located in the port which belong to industrial concerns. With regard to policy on maintenance, given the scarcity of capable local contractors and the nonavailability of spare parts other than those for widely used automobiles, it would be more effective if the port agency stocks its own inventory of spare parts and performs all the maintenance and repair work; only infrequent repairs requiring specialized equipment or skill should be contracted. These include repairs of the breakwater and maintenance dredging of the approach channel (the latter being outside the capability of the port-owned dredge). These works will probably be performed by foreign contractors.

In accordance with the practices generally applied in port organization, and taking into consideration the organizational and procedural arrangements being implemented by the SPA, the scope of activities of the maintenance unit in Kismayo Port is proposed to include:

3.2.1 Primary Functions

- o Maintenance and repair of port equipment
- o Lubrication and daily inspection of operating equipment
- o Maintenance and repair of buildings and structures

- o Maintenance of utilities
- o Maintenance dredging using the port's dredge in the sheltered area and a contractor's seagoing dredge for more exposed waters
- o Facilities inspection (internal inspections by the Kismayo Port management, in addition to inspections performed by the SPA Central Engineering Section).

3.2.2 Secondary Functions

- o Safety and fire fighting
- o Waste (particularly animal excrements) disposal
- o Pollution control
- o Ship service utilities supply
- o Requisition and storage of spare parts substock and purchase of raw materials for civil engineering repairs.

3.3 FACILITIES TO BE MAINTAINED

For the purpose of this study, the facilities to be maintained are classified into three categories: structures, utilities, and equipment. The molasses tank and its pipeline system, the banana shed, and the petroleum,

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oil, and lubricants (POL) pipeline installation are not listed because these specialized installations are owned and maintained by other organizations. The following listing includes present facilities as well as those that will be in place after the completion of the port rehabilitation project.

3.3.1 Structures (Infrastructures and Superstructures) to be Maintained

The structures to be maintained are:

- o a 9.5-meter-deep access channel 1,200 meters long
- o a harbor basin of 260,000 square meters with 9.5 meters dredge depth
- o 1,500 linear meters of rubble mound breakwater
- o 640 linear meters of sheetpile bulkhead, its fender system, and sacrificial-anode cathodic protection system
- o two Roll-on/Roll-off (Ro/Ro) paved ramps
- o two mooring dolphins
- o about 45,000 square meters of portland cement concrete pavement
- o about 2,200 linear meters of portland cement concrete paved access roadway

- o two transit sheds of 3,900 square meters with masonry walls, concrete framing, wooden sliding doors, and corrugated asbestos cement roofing
- o a raised two-story concrete/masonry administration building of 240 square meters with concrete framing and roofing, and cantilevered corridors on all sides of the building
- o miscellaneous buildings comprising a scale house, a longshoremen's building, fire pump and water pump buildings, a generator building, and a maintenance shed, with a total area of approximately 300 square meters
- o a navigational aids system comprising nine lighted buoys and seven land-based lights.

3.3.2 Utilities to be Maintained

The utilities to be maintained are:

- o a new electric lighting system, a power distribution system with ship service boxes (8), and the new port generating unit
- o a new potable water distribution system with ship service boxes (8), fed by the city water system, a water treatment system, and a pumping station in the port area

- o a new fire protection system with fire hydrants (4) and hose outlet boxes (4), fed by a seawater pumping station (two 1,000 gpm diesel-driven pumps) in the port area
- o a sanitary sewage system with new septic tanks (2)
- o a telephone system with underground lines connected to the City of Kismayo "Centrex" system.

3.3.3 Equipment to be Maintained

Listed below are the existing and proposed new operating equipment that will need to be maintained. For more details on existing operating equipment, refer to Appendix A.

<u>Equipment</u>	<u>Total Quantity</u>	<u>Operative</u>	<u>Needs Minor Repairs</u>	<u>Needs Major Repairs</u>	<u>Non- Repairable</u>
<u>Existing</u>					
Pontoon-mounted cutter section dredge (Dutch)	1		1*		
Tug boat (Dutch)	1	1			
Mobile cranes (various makes)	5	2	1		2
Forklifts (various makes)	2	1		1	
Tractors (Italian)	2	2			
Trailers	5	3	2		
Fire Truck (Fiat)	1	1			

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Proposed (excluding replacement)

23-ton mobile crane	1
Yard tractor	1
Container trailers	3
10-ton forklift truck	1
Water truck**	1

*A minor part in the gear assembly is required. This dredge is in the process of being rented out to a contractor working on the Berbera port project.

**The water truck is added to the equipment requiring maintenance as per request of USAID during the report review; it is not included in the Financial Plan of Section 6.

In addition to the above-listed equipment, replacement equipment will be provided as presented in Section 5.0.

3.4 MAINTENANCE WORKLOAD

The workload involved in primary maintenance activities is as follows:

A. Mechanical/Electrical

- o Daily check of working mobile equipment

- o Maintain and repair floating and mobile equipment. Yearly drydocking and overhaul hull work on the dredge and tug to be done by outside contractor or with supplemental hired labor. Painting and day-to-day keep-up chores are done by crew or operator.

Periodic check, adjustment, greasing, changing oil, replacing parts (monthly, quarterly, semiannually). Repair when equipment breaks down or shows alarming signs of wear or inefficient operation.

- o Maintain and repair fixed equipment
 - Periodic maintenance and repairs of generators and pumps (daily maintenance is done by the attendants)
 - Electrical repairs: area lighting system, navigational aids system, lights in sheds and buildings, air conditioners, fans
- o Supply electric power to ships.

B. Civil/Structural

- o Perform depth survey of harbor basin and access channel (annually and after storms)
- o Execute dredging works with in-house dredge along berths and in harbor basin
- o Cooperate with SPA in contracting dredging works in the access channel
- o Survey damage to the breakwater and cooperate with SPA in contracting any needed repair work

- o Inspect periodically the sheetpile bulkhead, the fender system, and the mooring dolphins: when required, remove rust, grind surfaces, weld reinforcing plates, and recoat the piles. Survey (by diver) the cathodic protection system anodes and perform corrective measures (relocating, replacing, adding anodes) according to the guidelines provided by the installing contractor.

- o Maintain pavement, roadway, and Ro/Ro ramp (portland concrete): patching, sealing joints, etc.

- o Maintain transit sheds and other port buildings: painting, roof and door maintenance and repairs, masonry and concrete repairs, etc.

- o Maintain utilities: plumbing repairs, inspection, and maintenance of septic tanks, sewage system (yearly), water supply and treatment system (monthly), and fire fighting system (monthly)

- o Maintain navigational aids system: checking locations, painting, replacing light bulbs, and arranging for contractors to overhaul and eventually reinstall buoys -- which cannot be done by in-house staff because the Port of Kismayo lacks a seagoing boat capable of being fitted with the 10-ton boom required

- o Operate potable-water and seawater pumps

- o Supply potable water to ships

- o Assist operating personnel in performing fire drills, fire protection, and fire fighting (with the cooperation of other port personnel and the town's fire fighting unit)

C. Clerical and Materials Office

- o Perform clerical work in the maintenance unit
- o Make requests to SPA Central Stores to establish and replenish a substock of spare parts necessary for the maintenance of floating and mobile equipment
- o Purchase locally the building materials for civil engineering maintenance and repair works (in coordination with the Port's Accounting and Finance Section)
- o Keep and manage stocks according to stockkeeping and accounting procedures
- o Keep records of all maintenance work performed by the Maintenance and Engineering Service.

3.5 PROPOSED ORGANIZATIONAL STRUCTURE OF THE MAINTENANCE UNIT

As indicated in Section 3.2, maintenance is expected to be more effective at Kismayo Port if the local port agency handles its own maintenance and repair work, with contract work reduced to a minimum. It is proposed that the

foregoing defined maintenance workload be handled by a new "Maintenance and Engineering Service" reporting to the Assistant Port Manager. According to the nature of the maintenance workload, this new unit will be composed of three divisions, the Mechanical/Electrical Section, the Civil/Structural Section, and the Clerical and Materials Office.

The organizational divisions of the proposed Maintenance and Engineering Service are presented in the organization chart (Figure 3-1).

3.6 STAFFING

To handle the maintenance workload presented in Section 3.4, both the Mechanical/Electrical and the Civil/Structural Sections will need additional personnel. On the organization chart (Figure 3-1), the number, skills, and functions of the 31 existing personnel were established from a review with the Kismayo Port Manager. Eight new hires (shown by asterisks) will be needed, bringing the total maintenance staff to 39.

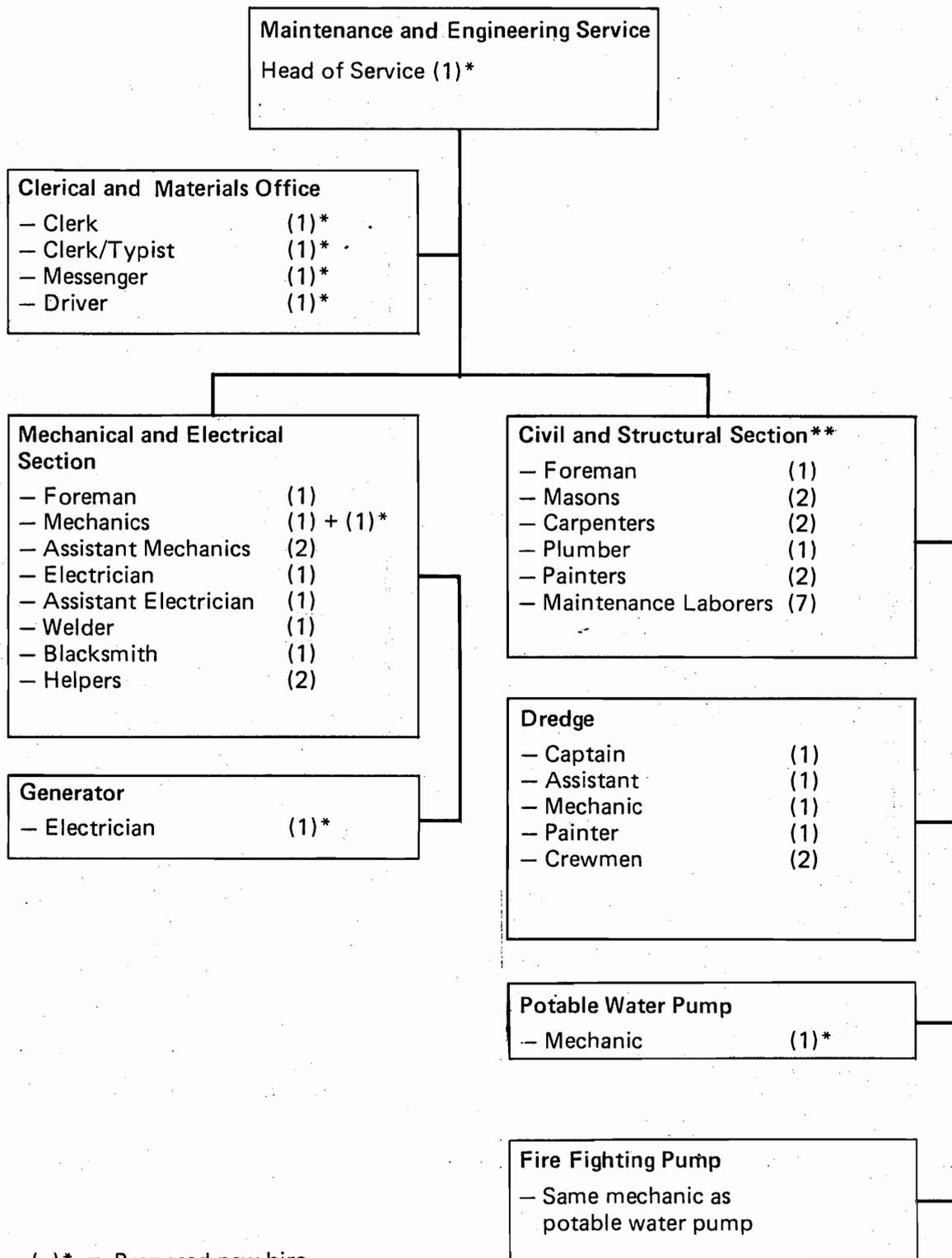
New hires will include:

- o Head of the Maintenance and Engineering Service (hired by SPA): 1
- o Staff for the Clerical and Materials Office (clerk, clerk/typist, messenger, driver): 4
- o Mechanics: 2
- o Electrician: 1
- Total 8

Figure 3-1

Kismayo Port Authority Proposed Organization Chart

Kismayo Port Rehabilitation—Port Maintenance Study



()* = Proposed new hire

() = Existing personnel

** The Civil and Structural Section should have at least one of its staff trained as a scuba diver for performing underwater inspection and maintenance.

The proposed staffing level is expected to be adequate for both the present and the rehabilitated port provided proper training is given to selected technicians and skilled workers.

Each new hire fulfills specific needs of the rehabilitated port. The need for a head of the Maintenance and Engineering Service is evident from the reasoning that leads to establishing such an independent service at all. Such a knowledgeable, independent technician will be necessary to coordinate and direct the new preventive maintenance procedures and to communicate specific maintenance needs to officials of Kismayo Port. The following discussion outlines the justification for each of the other new hires.

Skilled Maintenance Workers. Two additional mechanics are needed:

- o to eliminate the current backlog of maintenance work
- o to carry out repairs more quickly than is now possible
- o to carry out the planned preventive maintenance procedures as they are phased in.

Although the bulk of the new equipment will be added in 1988, the hiring of the two new mechanics should take place immediately (start of 1985) for several reasons. Working together with the one mechanic currently on the staff, they can largely clear away backlog work in advance of the time when too many new tasks are required of them by new equipment and new procedures. As port rehabilitation progresses, the new pumps for potable water and fire fighting will require the attention of one mechanic, while the other two mechanics and their two assistants can continue work on the backlog. Later,

when the training courses are instituted, all three mechanics will already be in place and ready to be trained to carry out the continuing preventive maintenance that will gradually replace backlog work. The additional workload required by the cargo-handling equipment purchased in 1988 will be balanced by an expected reduction in backlog and breakdowns (the result of good preventive maintenance). Thus the total workload is expected to remain roughly stable, so that the hirings of 1985 are expected to provide adequate staff for both the present and the rehabilitated (post-1988) port.

One additional electrician will be needed to be in charge of the new electric generating station that will be added during the port rehabilitation. His duties will include the operation and routine maintenance of the generators and the hooking-up and metering of electric power supplied to ships.

At least one person in the Civil/Structural Section should be trained to use scuba diving equipment to perform underwater inspection and maintenance.

Clerical and Materials Office Workers. The personnel assigned to this new office will be essential to the management of the preventive maintenance procedures. They will:

- o manage the spare parts substocks
- o requisition parts and materials
- o perform accounting and stockkeeping.

Their performance of these tasks will allow maintenance to proceed at a regular and efficient pace without the delays currently occasioned by lack of parts and materials.

For a port the size of Kismayo, the duties associated with the maintenance of substocks can be expected to require the fulltime services of one clerk. Ordinary office functions such as filing, handling correspondence, and typing will require a second person, a clerk/typist. A driver will be needed for the proposed pickup truck the office will need to make deliveries. A messenger will be needed to respond to requests from the head of the Service and to convey messages.

3.7 BUDGET REQUIREMENTS FOR MAINTENANCE STAFF

The budget requirements for maintenance staff are presented in Table 3-1 based on a salary grouped into five personnel categories:

Category A: Head of Maintenance Unit (recruited by SPA; salary paid by Kismayo Port)

Category B: Foreman, Dredge Captain

Category C: Assistant Dredge Captain, Office Clerk, Clerk/Typist, Mechanics, Electricians

Table 3-1:

Budget Requirements for Maintenance and Engineering Service

Kismayo Port Rehabilitation—Port Maintenance Study

Personnel Category	Monthly Salary	Number			Monthly Amount (Somali Shillings)		
		Required	Existing	New Hire	Required	Existing	New Hire
Category A	1,700	1		1	1,700		1,700
Category B	1,500	3	3		4,500	4,500	
Category C	1,200	9	4	5	10,800	4,800	6,000
Category D	1,000	14	13	1	14,000	13,000	1,000
Category E	700	12	11	1	8,400	7,700	700
TOTALS		39	31	8	39,400	30,000	9,400
TOTAL SALARY COST PER YEAR:					472,800	360,000	112,800

REMARKS

Category A: Head of Service (Recruited by SPA; Salary Paid by Kismayo Port)

Category B: Foreman, Dredge Captain

Category C: Assistant Dredge Captain, Office Clerk, Clerk Typist, Mechanics, Electricians

Category D: Driver, Assistant Mechanics, Assistant Electricians, Welder, Blacksmith, Mason, Carpenter, Plumber, Painters

Category E: Messenger, Helpers, Maintenance Laborers, Crewmen

Category D: Driver, Assistant Mechanics, Assistant Electricians,
Welder, Blacksmith, Mason, Carpenter, Plumber, Painters,
etc.

Category E: Messenger, Helpers, Maintenance Laborers, Crewmen

The table shows the average salary of each personnel category according to salary scales of Somali ports, the number of personnel required, the number existing at Kismayo Port, the number that could be assigned from SPA, and the number to be hired to fill the vacant positions. The last three columns of the table show respectively the monthly salary amounts corresponding to the total personnel required, the existing personnel, and new-hire personnel.

It is recommended that the full staffing be provided by mid-1985 before the training courses are scheduled.

The annual salary budget for the fully staffed Maintenance and Engineering Service will be SoSh 472,800.

It is felt that the present salary rates at Somali ports are not adequate to attract and retain proper staff. This is a problem common to Somali government agencies. However, as the scope of this study does not provide for a salary review, budgets can only be based on the existing salary scale.

3.8 MAINTENANCE EQUIPMENT

The existing maintenance equipment is listed in Section 2.0. This equipment is insufficient for carrying out an adequate maintenance of the port assets, and certain items should be replaced. With the rehabilitation of the port, more equipment will be needed to maintain the new facilities.

The required maintenance equipment consists of:

<u>Equipment</u>	<u>Quantity Needed</u>	<u>Remark</u>
o Electric drill	1	Existing but needs replacement
o Lathe 1.20 m	1	Existing but needs replacement
o 42-cm-dia. circular saw (Russian-made)	1	Existing but lacks blade. Saw blades to be purchased or adapted.
o 32-cm circular saw-planer-drill machine	1	Existing
o AC transformer-type welding machine	1	Existing
o Diesel-driven welding machine	1	Existing
o Oxygen-acetylene cutting-welding set	1	Existing
o Battery charger	2	One existing but capacity insuf- ficient. One second charger is needed to handle workload.
o Bench-mounted electric grinder	1	New
o Mobile garage jack	1	New
o Automotive chain hoists	2	New
o Portable greasing/oiling equipment (set)	1	Existing hand pump inadequate

<u>Equipment (Continued)</u>	<u>Quantity Needed</u>	<u>Remark</u>
o Garage compressor	1	New
o Air compressor for structural work	1	New
o Air-driven tools for structural maintenance	1	New
o hand-operated concrete mixer	1	New
o Pickup truck	1	New
o Scuba diving equipment	1	New

The bulkhead protective coating will require periodic inspections and repairs, particularly at the splash zone. This entails scraping and grinding the corroded parts to the bare metal and applying a new coating. Scraping and grinding will require an air compressor and air-driven equipment. Coating application will be by hand. The underwater part of the bulkhead will require inspection periodically by a diver to assess the effectiveness of the cathodic protection system. Should damage to the protective coating be discovered, repairs should be made using equipment operable under water.

The cathodic protection anodes should be inspected and their thickness measured at regular intervals to monitor the efficiency of the system. Repairs and/or replacement, if necessary, should be made in accordance with the installation contractor's instructions.

Concrete repairs require a compressor and air-driven chisels to remove the unsound concrete and replace it with epoxy-cement mortar. Air-driven

chisels and hammers and a small hand-operated concrete mixer are required for pavement and roadway repairs.

Regular maintenance of buildings and utilities, including painting and replacement of damaged parts, can be performed by means of hand tools.

Maintenance of navigation aids involves periodic scraping and repainting of buoys, their reinstallation when moved by storms, and changing of batteries and light bulbs. While the changing of batteries can be done with a small craft and a chain hoist, the maintenance of the underwater part and reinstallation of buoys requires a seagoing boat with a hoisting boom.

For routine yearly maintenance, this boat will lift the buoys and put them on its working deck for a day or two to carry out the body overhaul work and put them back into the sea. For more extensive repairs, required after a few years' time, or when a buoy suffers damage from being hit by a passing ship, it needs to be replaced and brought back to the workshop. This requires a larger, 10-ton capacity boom, preferably of the swinging type, for the handling operations at sea and at dockside. The present tug boat does not have adequate deck space and is also too small to be stable if fitted with a boom or A-frame of the required capacity. It is, therefore, recommended that the buoy body work either be performed with a hired boat or be accomplished by outside contractors.

The maintenance of the breakwater may require the placing or moving of heavy armor stones. This involves powerful cranes and heavy transport equipment and, therefore, should be accomplished by outside contractors. The

maintenance dredging of the access channel and harbor basin involves check soundings performed periodically and after storms, and the removal of deposits to restore the project depths. Soundings can be performed with a lead line or, preferably, with an ultrasonic fathometer or profiler. The depth restoration can be accomplished by the port's own dredge in the sheltered area and by outside contractors in more exposed waters.

The recommended additional equipment consists of:

Mechanical/Electrical Section Maintenance

- o one bench-mounted electric grinder
- o one mobile garage jack
- o two chain hoists
- o portable greasing/lubricating equipment
- o one garage compressor
- o one battery charger.

Civil/Structural Section Maintenance Equipment

- o one air compressor capable of operating two air tools
- o air-driven chisels, hammers, hose and drills, and grinding equipment
- o one mobile hand-operated concrete mixer
- o one pick-up truck
- o scuba diving equipment.

Estimated costs for Mechanical/Electrical Section maintenance equipment is U.S. \$10,000 for additional equipment and \$20,000 for replacing the lathe and the drill in the maintenance workshop. For Civil/Structural Section maintenance equipment, the estimated cost is U.S. \$30,000.

3.9 PROPOSED SCHEDULE FOR INSTITUTING ADMINISTRATIVE MEASURES

Table 3-2 presents a proposed schedule for instituting administrative measures pertaining to the functioning of the SPA's Central Engineering Section and the establishment and operation of the Maintenance and Engineering Service at Kismayo Port.

3.10 RELOCATION OF AUTOMOTIVE SERVICE SECTION

In addition to the organizational and procedural improvement, it is advisable to move the automotive service section of the existing maintenance workshop located outside the port (Figure 2-2) to the existing maintenance shed in the port compound in order to carry out more efficiently the daily maintenance of the mobile equipment. This shed is at the back of Berth 3, in the corner where the service buildings and the longshoreman's building are located (Figure 2-3) and is being used as a storage shed. The cost of such a relocation is estimated at U.S. \$500, assuming the use of in-house labor (Table 3-3).

Table 3-2

Proposed Schedule for Instituting Administrative Measures

Kismayo Port Rehabilitation—Port Maintenance Study

<u>Recommended Action</u>	<u>Proposed Date</u>	<u>Agency Responsible</u>
(1) Assign a third supervising engineer to SPA's Central Engineering Section and provide necessary clerical support to make the Central Engineering Section fully operational	As soon as possible in 1984	SPA
(2) Recruit a maintenance technician and assign to Kismayo Port	As soon as possible in 1984	SPA
(3) Establish the recommended "Maintenance and Engineering Service" at Kismayo Port (this Service will be headed by the maintenance technician indicated in item 2)	By end of 1984	SPA
(4) Recruit new personnel to fill the vacant positions in the "Maintenance and Engineering Service"	January 1985 or early in that year	Kismayo Port

Table 3-3

Cost Estimate Moving of Maintenance Workshop's Automotive Service Section Into Port Compound

Kismayo Port Rehabilitation—Port Maintenance Study

	<u>US\$</u>
1. Electric power hook up and lighting	300 ^a
2. Provision of workbenches	200 ^a
3. Moving of maintenance equipment	<u>N.A.^b</u>
	500
	Equivalent to SoSh 9,000 ^c

a. Using in-house labor and workshop.

b. No cost involved as equipment consists of portable equipment and hand tools.

c. Using the exchange rate US\$1.00 = SoSh 17.38 and rounding

4.0 PROPOSED TRAINING PROGRAM FOR PORT MAINTENANCE PERSONNEL

4.1 EXISTING PLAN FOR PORT PERSONNEL TRAINING

The SPA is in the process of establishing a training unit to be in charge of the training of port personnel in management, maintenance, and cargo operations. A Director of Training has been appointed. Training manuals, slides with narrative audio cassettes, and a slide viewer have been received from the United Nations Conference on Trade and Development (UNCTAD). These training materials are related to a course on management of general cargo operations.

At the time of this writing (middle of March 1984), a training course is being given in Mogadishu to the operating personnel of Mogadishu Port by a lecturer from UNCTAD and the Mogadishu Port Manager. Presentation of this course for training operating personnel of Kismayo Port has not been scheduled.

A training course in port management and operations was attended by SPA personnel in April-May 1984, in New York under the sponsorship of USAID.

4.2 TRAINING PROGRAM TO BE CONDUCTED DURING THE PORT REHABILITATION PERIOD

4.2.1 General

The Kismayo Port Rehabilitation will offer an opportunity to carry out on-the-job training for the maintenance personnel of Kismayo Port and for SPA

personnel. In effect, with the resources that will be mobilized for carrying out the construction work, in terms of personnel, equipment, and work organization, the contractor would have favorable conditions to conduct the training with actual practice of maintenance tasks. Moreover, with the construction work being carried out, the trainees can have the opportunity to observe and/or participate in the physical building tasks.

To profit by this occasion, it is suggested that maintenance skilled workers from Mogadishu and Berbera ports be encouraged to attend the on-the-job training courses even though they are primarily planned for Kismayo Port.

The training program is intended to inform the trainees of the needs for maintenance, the methods of maintaining the equipment and facilities, and the limitations of the equipment and the facilities. The classroom work will provide the knowledge needed by the trainees, and the on-the-job training will provide the experience.

The on-the-job training for equipment maintenance trainees should include working with the contractor's equipment maintenance personnel on the maintenance of the construction equipment and working with the contractor's installation personnel on the installation and testing of major equipment.

The on-the-job training for the civil/structural trainees shall include working with the contractor's personnel on several portions of the work, but should include at least the following: sheet pile driving, tie-rod installation, protective coating touch-up; cathodic protection installation; backfilling and compaction; concrete placement; and fender installation.

The on-the-job training should be provided to small groups of three or four so that each trainee gets the opportunity to participate in all phases of the work.

4.2.2 The Training Program

In order to ensure adequate maintenance performance, both management-level and worker-level personnel should receive training. Training for the management-level personnel will deal essentially with planned maintenance, supplies and inspection. Training for the worker-level personnel, dealing with actual maintenance tasks, will cover mechanical/electrical maintenance and civil/structural maintenance.

The training program as proposed consists of three separate training courses to cover the various functions in the maintenance organization: one course for personnel at management level and two courses for skilled workers and equipment operators. The course for maintenance management-level personnel will focus on the implementation of procedures for planned maintenance, supplies, and spare parts, and inspection, complemented by field observations. This course will consist of 10 days of classroom instruction in Mogadishu and 10 days of observation in Kismayo and will be presented by PBI. The courses for skilled workers and equipment operators will include one for equipment maintenance and the other for civil/structural maintenance. Each course will consist of 2 to 3 days of classroom instruction and 15 to 20 days of on-the-job training. These courses will be presented by the construction contractor under the supervision of PBI, and will each consist of a short lecture period followed by a more extended period of on-the-job training with

participation in actual tasks under the guidance of a supervisor assigned by the construction contractor. The port equipment operators should attend the course on equipment maintenance so they become acquainted with the needs for maintenance and the operational limits of the equipment they operate. Outlines of these three training courses are presented in Appendices B through D.

Due to the relatively low literacy level of the skilled workers and equipment operators and their lack of English, training manuals for these workers should be prepared in an easily understandable schematic form consisting essentially of sketches. Words should be kept as few as possible and should be written in local language and English. An English-Somali interpreter/translator must be provided by the Somali Ports Authority for the preparation of training manuals and to assist the trainer(s) throughout the training process.

For the maintenance management course the training manual will be in English and will also contain many illustrations. For the preparation of this training manual, the manual prepared by Price Waterhouse Associates (PWA) on "Maintenance Costing and Planned Maintenance" is included in Appendix E of this report. The PWA manual on "Stores Recording and Stock Control" will be supplied by the SPA. These PWA manuals were prepared for the SPA in 1977. The new training manual should complement and/or update these procedures and focus on their implementation.

4.3 NUMBER AND TYPE OF PERSONNEL TO BE TRAINED

4.3.1 Training Course for Maintenance Management

This course will be destined for the SPA Central Engineering Section staff and maintenance supervisors assigned by SPA to the ports.

The number of trainees will be:

o SPA Central Engineering Section	:	3
o Mogadishu, Berbera, and Kismayo Ports	:	3
o Possible additional trainees	:	<u>3</u>
TOTAL	:	9

4.3.2 Training Course for Equipment Maintenance

This course will be destined essentially for the foreman and selected skilled workers of the Mechanical/Electrical Section, and equipment operators at Kismayo Port. However, in order to benefit from the training opportunity, other ports should be encouraged to send their personnel to attend the course.

The number of trainees will be:

Kismayo Port

o Foreman, Mechanical/Electrical Section	:	1
o Mechanics, electricians	:	5

o	Equipment operators (attending part of the course)	:	<u>4</u>
		:	10
	<u>Mogadishu and Berbera Ports</u>	:	<u>10</u>
	TOTAL	:	20

4.3.3 Training Course for Civil/Structural Maintenance

For the same reason indicated above, in addition to trainees from Kismayo Port, there should be a number of participants from other Somali ports.

The number of trainees will consist of:

Kismayo Port

o	Foreman, Civil/Structural Section	:	1
o	Skilled workers	:	<u>4</u>
		:	5
	<u>Mogadishu and Berbera Ports</u>	:	<u>10</u>
	TOTAL	:	15

4.4 SCHEDULE OF TRAINING

The training courses should be carried out after the contractor has started actual construction of the main elements of the work. They should be scheduled for a period when many construction tasks are being carried out to offer the opportunity for observing and training on the job.

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The following timing for starting the training courses is suggested:

Maintenance management course (20 days)	: January 1986
Mechanical/Electrical Equipment maintenance course (23 days)	: February 1986
Civil/Structural maintenance course (23 days)	: February 1986

The timing will correspond to the construction of Berths 1 and 2, and to the installation of the equipment for electrical and water supply and for fire protection, according to the construction schedule anticipated at the time of this writing. This timing should be checked against the latest implementation schedule and revised accordingly.

4.5 COST OF TRAINING

The cost of preparing the training manuals, the cost of providing instruction, and those costs associated with performance evaluation and certification are detailed in Tables 4-1 and 4-2 and are summarized below.

Training course for maintenance management personnel	: \$ 46,000
Training course for mechanical/electrical equipment maintenance personnel	: \$ 50,000
Training course for civil/structural maintenance personnel	: <u>\$ 50,000</u>
TOTAL	: \$146,000

These estimated costs do not include the cost of providing classrooms with furniture and supplies in Mogadishu and Kismayo, a translator/interpreter, and

Table 4-1

Cost Estimate Training Course for Maintenance Management Personnel^a

Kismayo Port Rehabilitation—Port Maintenance Study

A. Person-Days for Course Preparation and Instruction

Task	Staff (Person-Days)		
	Engineer	Draftsman	Training Assistant ^b
1. Preparation of training manual:			
— in Trainer's home office	15	5	5
—in Somalia ^c	15	—	5
2. Classroom instruction	10	—	—
3. On-the-job training:			
— Practice ^d	5	—	—
— Observation ^e	5	—	—
4. Performance evaluation and certification	2	2	—
	52	7	10

B. Cost of Preparation and Instruction

1. Personnel:		US\$	SoSh
— Engineer: 52 person-days @ \$600 = \$31,200			
— Draftsman: 7 person-days @ \$250 = \$ 1,750			
— Training assistant: 10 person-days @ \$420 = \$ 4,200		\$37,150	—
2. Typing, duplicating of training materials		\$ 2,000	—
3. Miscellaneous (round trip Mogadishu-Kismayo, certificate, supplies, etc.)		\$ 1,850	—
4. International travel		\$ 2,600	—
5. Per diem: 43 days @ \$54		\$ 2,322	—
	Total	\$45,922	—
		Say \$46,000	

C. SPA's Cost

1. Provision for classroom, 15 days	= N:A. ^f		
2. Classroom utilities and supplies	= SoSh 5,000		
3. Per diem for observation period in Kismayo: (9 trainees + 1 driver) x (5 + 2 for travel) days x SoSh 695 ^g	= SoSh 48,650		
4. Transport to, from, and in Kismayo (Car Rent Basis):			
— Minibus: 7 days @ SoSh 1,500 ^h	= SoSh 10,500		
— Gas: (80 liters x 2 + 20 liters x 5 x SoSh 7/liter)	= SoSh 1,820	—	SoSh 65,970
5. Miscellaneous		—	SoSh 4,030
	Total	—	SoSh 70,000

D. USAID's Cost

1. Review training course, certification: 8 person-days @ \$600	\$ 4,800	—
2. Miscellaneous	\$ 200	—
	Total	\$ 5,000

E. Recapitulation

Preparation and instruction cost	\$46,000	—
SPA's cost	—	SoSh 70,000
USAID's cost	\$ 5,000	—
	Total cost	\$51,000
		SoSh 70,000
		(Equivalent to \$4,028 at rate: \$1.00 = SoSh 17.38)

Remarks

- Place of training: Mogadishu.
- Engineer or technician.
- Research and review procedures adopted at SPA and those recommended by Price Waterhouse Associates, completion of training documents.
- Practice on application of procedures for maintenance planning, stockkeeping, and inspection.
- Observation of construction and maintenance work in Kismayo (to be scheduled in coordination with training sessions for equipment and civil/structural maintenance destined to skilled workers and equipment operators).
- Assuming the use of the Mogadishu Port's classroom or the one at the education center belonging to the Ministry of Education (that was used in March 1984 for the training on cargo operations).
- Using USAID per diem rate: \$40 x 17.38 = SoSh 695.
- Car rental: \$85 x 17.38 = SoSh 1,477, say SoSh 1,500/day.

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Table 4-2
Cost Estimate Training Course for Equipment Maintenance or Civil/Structural Maintenance^a
 Kismayo Port Rehabilitation—Port Maintenance Study

A. Person-Days for Course Preparation and Instruction

Task	Staffing (Person-Days)			
	Engineer	Draftsman	Translator/Interpreter	Training Assistant ^b
1. Preparation of Training Documents				
– in Trainer's home office	15	5	–	5
– in Somalia ^c	10	3	10	–
2. Classroom instruction	3	–	3	–
3. On-the-job training	20	–	20	20
4. Performance evaluation	2	–	2	2
5. Certification	2	1	2	–
	52	9	37	27

B. Construction Contractor's Cost^d

1. Personnel:		US\$	SoSh
– Engineer: 52 person-days @ \$600 =	\$31,200		
– Draftsman: 9 person-days @ \$250 =	\$ 2,250		
– Training Assistant: 27 person-days @ \$320 =	\$ 8,640	\$42,090	–
2. Typing, duplicating of training manuals		\$ 3,500	–
3. Miscellaneous (certificate, supplies, etc.)		\$ 1,400	–
	Total	\$47,000	–

C. Engineering Supervision Cost^d

Coordination and general supervision: 5 person-days @ \$600 \$ 3,000 –

D. SPA/Kismayo Port's Cost

1. Translator/Interpreter (from Mogadishu):			
– Salary: (37 + 2 for travel) person-days @ SoSh 1,700/20 ^e	–	SoSh 3,315	
– Per diem: 55 days @ SoSh 695 ^f	–	SoSh 38,225	
2. Provision of classroom (10 days)	–	N.A. ^g	
3. Classroom utilities and supplies	–	SoSh 5,000	
4. Per diem for trainees from other ports: (10 trainees + 1 driver) x (39 + 2 for travel) days x SoSh 695 ^f	–	SoSh 313,445	
5. Transport to, from, and in Kismayo (car rent basis):			
– Minibus: 41 days x SoSh 1,500 ^h	–	SoSh 61,500	
– Gas: (80 liters x 2 + 20 liters x 27) x SoSh 7/liter	–	SoSh 4,900	
6. Miscellaneous	–	SoSh 3,615	
	Total	–	SoSh 430,000

E. USAID Cost

1. Review training course, certification: (5+3) person-days @ \$600	\$ 4,800	–
2. Trip Mogadishu-Kismayo for certification:		
– Per diem: (1 officer + 1 driver) x 3 days x \$40	\$ 240	–
– Car: 3 days x \$85 + 180 liters (SoSh 7/liter ÷ 17.38)	\$ 328	–
3. Miscellaneous	\$ 632	–
	Total	\$ 6,000

F. Recapitulation

1. Instruction cost:		
– Construction contractor's cost	\$47,000	
– Engineering supervision cost	\$ 3,000	
	Total instruction cost	\$50,000
2. SPA/Kismayo Port's cost		SoSh 430,000
3. USAID's cost	\$ 6,000	–
	Total cost for each course	\$56,000 and SoSh 430,000
		(Equivalent to \$24,741 at rate: US\$1.00 = SoSh 17.38)

Remarks

a. Place of training: Kismayo.

b. Maintenance man/equipment operator.

c. Translation, completion of training manual/documents.

d. Assuming the use of personnel and means available at construction site in Kismayo.

e. SPA salary rate as per Table 3-1.

f. Using USAID per diem rate: \$40 x 17.38 = SoSh 695.

g. Kismayo Port has a furnished classroom at the workshop site.

h. Car rental: \$85 x 17.38 = SoSh 1,477, say SoSh 1,500/day.

costs associated with trainees, such as wages, transport, living expenses, etc., that should be provided by SPA. Not all of these need be special expenses; it is assumed that classrooms will continue to be available without extra expense at both Kismayo and Mogadishu, as is currently the case. During the period of on-the-job training the trainees will be employed, at no cost to the contractor, in the actual performance of work. Cost to the contractor will include supervision and evaluation of the trainee performance.

5.0 ANTICIPATED NEED AND COST FOR REPLACING AND ADDING CARGO-HANDLING EQUIPMENT

The present utilization ratio of port equipment is rather low. Records have not been kept, but discussions with the port management indicated that the utilization ratio is about 30%. This is readily understandable considering the cargo handled at Kismayo. Banana exports are loaded directly from trucks by ship's gear. Livestock are either herded directly on board or hoisted aboard by ship's gear. Bagged cargo are also unloaded by ship's gear with slings onto trailers for transfer to sheds. General breakbulk cargo are usually discharged by using ship's gear and dock pallets, which are moved to the shed by forklift trucks.

If properly maintained, the existing equipment listed in Section 3.3 and described in Appendix A would be adequate for handling ordinary cargo for the near future, as determined from the future cargo volumes estimated in the Preliminary Design Report. This equipment, however, should be replaced when it reaches its useful life of 8 to 10 years (most in 1988). No replacement is needed, however, for the 3-ton, 8-ton, and 17-ton cranes, as general cargo operations are performed essentially by ship's gear and forklift trucks. The remaining mobile cranes will provide sufficient capacity for handling odd-shaped general cargo. A 5-ton forklift truck with clamp attachment is needed earlier, in 1985, replacing the existing 5-ton PGS forklift truck, to handle paper rolls used for banana boxing. The import volume of these rolls is expected to increase to keep up with the rapidly growing banana export

business. In fact, the banana cultivation area along the Juba River is being expanded, and the export tonnage for 1984 through Kismayo is expected to almost double that of 1983, which was recorded as 30,000 metric tons.

In the future, with the economic development of the southern region, it is expected that Kismayo Port will receive some containerized cargo coming on Ro/Ro ships or on decks of conventional ships. The ship-handling (loading and unloading) of these containers, likely all 20-footers, will be by ship's forklift trucks or ship's gear. This ship's equipment will place containers onto or remove them from the Port's trailers. The transfer between the ship and the storage yard, and the loading/unloading at the yard will be the Port's responsibility and will require a 23-ton mobile crane, a yard tractor, and three 20-foot trailers, as well as a 10-ton forklift truck to handle empty containers.

No equipment is proposed for the operation of the banana chill shed as this is not presently Port Authority property.

The following time-phased purchases of cargo-handling equipment for the Port of Kismayo are recommended:

1985

- o one diesel 5-ton forklift truck (replacement)
- o one set of clamp attachments for handling paper rolls (new)
- o four crane pallet forks (new)

1988

- o one 23-ton mobile crane for container and heavy lift (new)
- o one 12-ton mobile crane (replacement)
- o one 5-ton mobile crane (replacement)
- o three yard tractors (1 new for container operation, 2 replacement)
- o three 20-foot container trailers (new)
- o five 10-ton trailers (replacement)
- o one 10-ton forklift truck for container operation (new)
- o one 3-ton forklift truck (replacement)

6.0 FINANCIAL PLAN FOR MAINTENANCE AND EQUIPMENT PROCUREMENT

The tables at the end of this section present costs for maintaining mobile and fixed assets (Tables 6-1 and 6-2, respectively), and combine these costs with previously presented material in developing a five-year financial plan for maintenance and equipment procurement (Table 6-3). This plan is based on Kismayo Port's cargo forecasts and requirements for cargo-handling equipment as estimated in Sections 3 and 4 of the Preliminary Design Report. The table combines the following items discussed elsewhere in the present Port Maintenance Study Report:

- o Salaries of maintenance personnel (in Somali shillings). These are based on Figure 3-1 and Table 3-1, calculated using the current SPA salary scale, and assuming for planning purposes that the vacant positions in the new Maintenance and Engineering Section are filled at the beginning of 1985. Salaries are assumed to remain constant throughout the period covered. Although no provision for increase has been included in the calculation, it is desirable that a salary raise be instituted in keeping with the cost of living to ensure the port personnel's devotion to their daily duties. If this is realized, the budget salary figures should be revised accordingly.

- o Spare parts and materials for maintaining mobile assets (from Table 6-1).

- o Materials for maintaining fixed assets (from Table 6-2). The annual materials maintenance cost of a new facility is estimated as a

percentage of the facility's capital cost at purchase. For an existing facility, the annual materials maintenance cost is estimated as a percentage of the revaluated book value of the facility, or else estimated costs are used. The percentages used (for both fixed and mobile assets) are one-half the total percentages generally accepted for facility maintenance and give the materials component of maintenance costs, assuming that 50 percent of the total maintenance costs are for materials. For both fixed and mobile assets, costs are stated as a U.S. dollar portion and a Somali shilling portion.

- o Investment cost for purchasing maintenance equipment (from Section 5.2). These costs include separately stated costs for the Mechanical/Electrical Section, and for the Civil/Structural Section.

- o Investment cost for purchasing new cargo-handling equipment (from Section 5.1).

Table 6-1

Spare Parts and Materials Cost for Maintenance of Mobile Assets

Kismayo Port Rehabilitation—Port Maintenance Study

Item	Quantity	Yearly Maintenance Parts & Materials Cost					
		Unit Capital Cost \$ 000	Maintenance % of Capital	Total Maintenance Cost	Foreign Currency Share		Local Currency Share
					%	.\$	
Existing Equipment							
Tug Boat	1	1,500	5	75,000	100	75,000	—
Dredger	1			100,000	100	100,000	—
5-ton Crane	1	100	5	5,500	100	5,500	—
8-ton Crane	1	130	5	6,500	100	6,500	—
12-ton Crane	1	170	5	8,500	100	8,500	—
3-ton Forklift Truck	1	40	5	2,000	100	2,000	—
5-ton Forklift Truck	1	45	5	2,250	100	2,250	—
Tractors	2	30	5	3,000	100	3,000	—
Trailers	5	8	2	800	100	800	—
Subtotal [existing]				\$203,550		\$203,550 Say \$204,000	
Net New Equipment							
Add [1988]							
10-ton Forklift Truck	1	85	5	4,250	100	4,250	—
23-ton Mobile Crane	1	200	5	10,000	100	10,000	—
Yard Tractor	1	60	5	3,000	100	3,000	—
20-foot Container Trailers	3	12	2	720	100	720	—
Subtotal [new]				\$14,970		\$14,970 say \$15,000	
Delete [1988]							
8-ton Crane	1	130	5	6,500		(6,500)	
Subtotal [net]						\$ 8,470 say \$ 8,000	
TOTAL [After 1988]						\$212,000	

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Table 6-2

Materials for Maintenance of Fixed Assets^a

Kismayo Port Rehabilitation—Port Maintenance Study

Item	Yearly Maintenance Materials Cost					
	Capital Cost \$ 000	Maintenance % of Capital Cost	Total Maintenance Cost \$	Foreign Currency		Local Currency Share \$
				Share %	\$	
Sheetpile Bulkhead	23,270	0.3	69,810	100	69,810	
Fendering	1,113	0.3	3,339	100	3,339	
New Concrete Pavement	2,196	0.5	10,980	50	5,490	5,490
Existing Concrete Pavement and Roadway ^b	5,016	0.5	25,080	50	12,540	12,540
Transit Shed ^b	621	0.5	3,105	50	1,553	1,552
Administration Building ^b	387	0.5	1,935	50	968	967
Miscellaneous Buildings ^b	175	0.5	875	50	483	437
Navigational Aids ^c	625	5.0	31,250	100	31,250	
Utilities	245	0.5	1,225	50	613	612
Breakwater ^b	10,651	0.1	10,651	50	5,326	5,325
Total for New and Existing Assets			\$158,256 Say \$158,000		\$131,327 Say \$131,000	\$26,923 Say \$27,000 (Equivalent to SoSh 470,000)^d

Total for Existing Assets Only (Items marked <i>b</i>, plus half of <i>c</i>)	\$ 36,450 Say \$ 36,000	\$20,821 (Equivalent to SoSh 362,000)^d
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a. Maintenance Dredging Not Included

b. Existing

c. Some Existing (Assume 50%)

d. Rate US\$ 1.00 = SoSh 17.38 and Rounding

Table 6-3.
**Five-Year Financial Plan for Maintenance
and Equipment Procurement^a**

Kismayo Port Rehabilitation—Port Maintenance Study

Item	1985		1986		1987 ^b		1988		1989	
	Foreign (US\$)	Local (SoSh)	Foreign (US\$)	Local (SoSh)	Foreign (US\$)	Local (SoSh)	Foreign (US\$)	Local (SoSh)	Foreign (US\$)	Local (SoSh)
Maintenance Costs										
– Salaries ^c		472,800		472,800		472,800		472,800		472,800
– Spare parts and materials for mobile assets	204,000		204,000		204,000		204,000		212,000	
– Materials for fixed assets	36,000	362,000	36,000	362,000	36,000	362,000	131,000	470,000	131,000	470,000
Total maintenance cost	240,000	834,800	240,000	834,800	240,000	834,800	335,000	942,800	343,000	942,800
EQUIPMENT INVESTMENT COST										
Maintenance Equipment										
– Mechanical/Electrical Section	30,000									
– Civil/Structural Section	30,000									
Cargo Handling Equipment										
– 5-ton forklift truck with clamp attachment	50,000									
– Crane pallet forks (4 sets)	5,000									
– 23-ton mobile crane (1)							200,000			
– 12-ton mobile crane (1)							150,000			
– 5-ton mobile crane (1)							110,000			
– Yard tractors (3)							120,000			
– 20' container trailers (3)							36,000			
– 10-ton trailers (5)							50,000			
– 10-ton forklift truck (1)							85,000			
– 3-ton forklift truck (1)							40,000			
Total Equipment Investment Cost	115,000						791,000			
Training Courses										
– for maintenance management personnel	46,000 ^d									
– for mechanical/electrical equipment maintenance personnel	50,000									
– for civil/structural maintenance personnel			50,000 ^d							
Total Training Cost	96,000		50,000							
Moving of Automotive Service Section										
Electric power hook up, lighting, workbenches		9,000								
Total Moving Cost		9,000								
GRAND TOTAL										
Foreign Currency (US\$)	451,000		290,000		240,000		1,126,000		343,000	
Somali Shillings		843,800		834,800		834,800		942,800		942,800

Remarks

- a. The financial plan is based on 1984 US dollars and an exchange rate of US\$1.00 = SoSh 17.38 as of April 1984.
b. Completion of rehabilitation construction work.
c. See Table 3-1 for breakdown of workers by safety category.
d. Instruction cost only, excluding SPA's and USAID's costs. See Tables 4-1 and 4-2.

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APPENDIX A

OPERATING EQUIPMENT AT KISMAYO PORT
(March 1984)

<u>Equipment</u>	<u>Brand Name (Make)</u>	<u>Description</u>	<u>Age**</u>	<u>Condition</u>
Tug boat WAAMO 15.7 m*	Dutch-built	Two 730 hp Caterpillar engines model 3480T	5	Good Condition.
3-ton crane	Jones KL66 (England)	2 axles, 4 wheels	15 ⁺ /-	Nonoperative. Broken and rusty. Not repairable.
5-ton crane	Jones (England)	2 axles, 4 wheels	8 ⁺ /-	Operative. Poor upkeep conditions, rusty. Battery needed.
8-ton crane	Ruston Bucyrus (USA)	Track-mounted	15 ⁺ /-	Operative. Needs oil filter and pads for winch brake. In poor general condition.
12-ton crane	P & H Kobe (Japan)	3 axles, 10 wheels	8 ⁺ /-	Operative. Needs new radiator.
17-ton crane	Lima (USA)		15 ⁺ /-	Nonoperative. Broken and rusty. Not repairable.
3-ton forklift truck	Lancer Bros. (England)		4 ⁺ /-	Operative. Needs new battery.
5-ton forklift truck	PGS		6 ⁺ /-	Nonoperative. Needs major repairs.

*Tug boat JUBBA of same particulars and age as tug boat WAAMO but equipped with two 800 hp MWM engines is on loan to Mogadishu Port.

**Except for the two tug boats, no records exist; equipment ages are estimated by operating personnel through recollection.

APPENDIX A

OPERATING EQUIPMENT AT KISMAYO PORT
(March 1984)
(Continued)

<u>Equipment</u>	<u>Brand Name (Make)</u>	<u>Description</u>	<u>Age</u>	<u>Condition</u>
Tractor	Same - Mini Taurogo (Italy)	Farm type	7 ⁺ /-	Operative. Needs new battery.
Tractor	Same - Mini Taurogo (Italy)	Farm type	7 ⁺ /-	Operative. Needs new battery.
5-ton trailer		1.20 m high Wooden decking	8 ⁺ /-	Operative. Rusty chassis, rotten deck.
5-ton trailer		1.20 m high Wooden decking	8 ⁺ /-	Same as above.
5-ton trailer		1.20 m high Wooden decking	8 ⁺ /-	Same as above.
8-ton trailer		0.7 m high Steel decking	8 ⁺ /-	Operative. Rusty deck.
8-ton trailer		0.7 m high Steel decking	8 ⁺ /-	Same as above.

APPENDIX B

OUTLINE OF
TRAINING COURSE FOR
MAINTENANCE MANAGEMENT PERSONNEL

1.0 ORGANIZATION AND DURATION

- o Classroom instruction: 10 days in Mogadishu.
- o Observation: 10 days in Kismayo (to be scheduled in coordination with the training of skilled workers to permit observations of the physical work during the on-the-job training period).
- o Performance evaluation and certification: 2 days.

2.0 TRAINEE'S BACKGROUND (Estimated Number of Trainees: 9)

- o Fluent in English.
- o Engineering/maintenance management staff from SPA and from Somali ports having various degrees of experience.
- o College graduate level.

3.0 POSITION EXPECTED AFTER TRAINING

- o Senior maintenance staffer at SPA's Central Engineering Section (most senior position in maintenance organization in the Somali port system).

- o Head of maintenance unit at Somali ports.

4.0 PROGRAM

4.1 Functions of a Maintenance Unit

4.2 Operational Policy

"In-house" maintenance versus contract maintenance: economics, practicality aspect, routine works, specialized works, emergency and peak volume works, occasional odd jobs.

4.3 Preventive Maintenance Program

4.3.1 Economics

- o Cost of the program versus benefits derived from reducing repair costs, preventing disruption of operation due to equipment failure, and improving facility performance and operation safety.

- o Comparison between "planned maintenance" and "crisis maintenance" (or "fire fighting maintenance") with respect to lost time and overall cost - in particular when foreign exchange is scarce and in tight control, causing delays of many months for getting spare parts from foreign dealers.

4.3.2 Safety: Cost of Accidents and Health Hazards

4.3.3 Scope

- o Equipment maintenance (Mechanical/Electrical Section)
- o Civil/structural maintenance (Civil/Structural Section)
- o Safety methods and regulations:

4.4 Particular Aspects of a Port Maintenance Program

- o Effects of port environment on structures and equipment:
 - sea or brackish water: dissolved solids, marine borers, stray currents, wave actions, corrosive and deteriorating effects
 - marine atmosphere: high humidity, dissolved solids in mist
 - industrial environment.

o Operational and environmental hazards:

- overhead cargo handling, heavy lift, high piling of cargo
- hazardous conditions of work spaces: reduced lighting, sight obstructions, physical conditions of floor space, ship's hold
- intensity and diversity of handling movements
- traffic of handling equipment
- hazardous nature of cargo: explosives, inflammable products, chemicals, dusty cargo.

4.5 Planning and Monitoring of Maintenance Schemes

4.5.1 Preparation of Maintenance Plan (equipment, civil/structural)

Factors to be considered:

- o Schedules recommended by equipment manufacturer
- o Age of equipment
- o Intensity of use
- o Operating conditions

- o Safety conditions
- o Aptitude and attitude of operator
- o Seasonality of port traffic and fluctuation cycle of cargo movement (maintenance works should be scheduled at off-peak periods)
- o Inspection cycles recommended for structures and utilities
- o Seasonal and periodic factors (rainfall, tides, etc.).

4.5.2 Operating and Monitoring Procedures

- o Work order system: master plan for maintenance, wall chart, job cards, etc.
- o Record keeping system:
 - "Log book" for each piece of equipment (daily recording of utilization times, hour meter readings, conditions under which work is performed, fuel and oil consumption, breakdowns, maintenance and repair works, etc.).
 - "Central record" at the Port's Maintenance Unit (with an updated copy at SPA Central Engineering Section): comprehensive record for each fixed asset or piece of

equipment including specifications, manufacturer, date of purchase (or construction), complete history of maintenance and repair (cost of labor, parts, or materials).

- "Daily operating record card" (kept weekly by the Port's maintenance clerk from data in the log book): information on equipment operation and maintenance time, calculation of percentage of equipment availability and utilization.

- "Accident Reports."

4.6 Stocking of Spare Parts and Materials

- o Economics: comparison of cost of keeping large inventories of spare parts versus cost of disruption of operation due to nonavailability of equipment and waiting for parts (idle labor and other equipment, increases in cost per ton of cargo handled, lower customer's satisfaction, deterioration of equipment waiting idle in hot and marine environment, etc.).

- o Procedures (Refer to procedure manual on stores recording and stock control drawn up by Price Waterhouse Associates)
 - establishment of initial stock (survey of existing equipment, consultation of maintenance manuals by manufacturers)

- replenishment of stock (reordering point, reordering quantity, lead time, rate of usage .

- allocation of substocks to ports (quantity, rate of usage).

4.7 Maintenance Dredging of Entrance Channel and Harbor Basin

- o Periodic depth surveys, particularly after storms and floods.

- o Preparation and implementation of dredging plans: in-house or contract works.

- o Dumping of dredge spoil.

4.8 Maintenance Inspections

4.8.1 Types of Inspections

- o Routine inspections: frequency, checklists, inspection procedures, inspection report (recording of inspection results, conversion into work programs, recommendations of repair and safety-improvement methods, estimates of manpower material requirement, determination of degree of urgency, etc.).

- o Inspection of damage repair in emergency situations: accidents; damage caused by men or nature; safety conditions; evaluation of hazards and obstructions to traffic; immediate

actions for safety or for prevention of further damage; survey of damage and estimates of repair costs; etc.

4.8.2 Mechanical Equipment Inspections

- o Examination of central records, daily operating record cards and log book, and safety records.
- o Physical inspection of equipment: equipment up-keep condition, hazards associated with equipment condition, evidence of wear, overload, cleanliness, performance test.

4.8.3 Structural Inspections

A. General

- o Frequency and checklists.
- o General inspections should include factors such as deck or floor loading (static and moving loads), degree of occupancy or use, drainage, sanitation, hazards associated with physical conditions of structures and their use, etc.
- o Inspection reports should include description of symptoms of deterioration or failure, summary of inspection procedures, determination of cases of deterioration or failure, suggestion for method of repair, and improving safety.

B. Inspection of Marine Structures

o Concrete structures:

- Type of deterioration: breakage, cracking, spalling, wear from abrasion, pitting, crumbling, sulphate attack, aggregate reaction, etc.
- Inspection procedures: visual observation, probing, coring, etc.
- Method of repair: replacement, epoxy sealing and healing, shotcreting, jacketing, fendering, etc.

o Steel structures:

- Type of deterioration: rusting, pitting, etc.
- Inspection procedures: visual observations, drilling, measure of effectiveness of cathodic protection system, etc.
- Method of repair: welding, painting, coating, jacketing, improvement of cathodic protection system, etc.

C. Inspection of roadways and storage yards

- o Type of deterioration: weathering, ravelling, spalling, cracks, potholes, bleeding, settlement depression, edge breaking, etc.
- o Inspection procedures: visual observation, coring, etc.
- o Method of repair: patching, filling and sealing of cracks and joints, filling and raising of depressed areas, providing outlets for ponded water, etc.

D. Inspection of buildings

- o Signs of deterioration:
 - concrete: spalling, cracks, rust stains
 - steel: corrosion, loose weld points, loose bolts
 - wood: fungus attack, weathering, rotting, cracks.
- o Waterproofing of roof, skylights, and windows; water drains.
- o Cargo doors: damage by cargo-handling vehicles, sliding/suspension rails and wheels, guide rails, other hardware and locks.

- o Electrical and plumbing fixtures.

- o Painting, general up-keep.

E. Inspection of navigational aids

F. Inspection of utilities

- o Potable water system: pumps, filters, meters, water quality, leakage, etc.

- o Sanitary sewage system: inspection of water from septic tank outlet, condition of traps, manholes, and pipelines, etc.

- o Storm drainage system: water ponding, or back-up, conditions of ditches and drains, etc.

- o Electrical distribution and lighting system: generators, wiring, delimiting of hazardous areas and posting warning signs, etc.

G. Inspection of fire protection system

- o Inspection of fire alarm system (smoke detectors, bell system).

- o Hydrant and hose system (pressure test).

- o Fire trucks, fire boats.
- o Fire extinguishers (with posted instructions for use).
- o Posted instructions for fire protection.
- o Fire drills.

H. Safety and general inspection

- o Safety in operational practices: posting of safety signs in workshops, work areas, intense traffic areas, and road intersections.
- o Safety in work conditions: regulations for preventing accidents.
- o Health hazards associated with cargo: regulations for eliminating/reducing risks.
- o Pollution prevention, particularly related to cattle excrement and oil drip.
- o Enforcement of safety methods and regulations.
- o Facility up-keep, general cleanliness.

- o Etc.

5.0 SUGGESTED TRAINING TECHNIQUES AND PROCEDURES

5.1 Classroom instruction

- o Use audio/visual aids extensively.
- o Concentrate on discussing planning procedures and practicing the actual operation of the procedure (filling out documents and forms).
- o Have trainees perform asset inspections with checklists and make reports.

5.2 Observation period

- o Make demonstrations of repair and maintenance techniques explained in classroom.
- o Schedule observation period in accordance with contractor's construction schedule and skilled worker's training schedule to demonstrate construction techniques and maintenance procedures.
- o Arrange for observation or attendance of a number of on-the-job training sessions destined for skilled workers.

6.0 FORMAT OF TRAINING MATERIALS

- o Extensive use of illustrations and cartoons.
- o Concise text.
- o Extensive reference and bibliography.

7.0 COMPOSITION OF TRAINING MATERIALS

The trainer should consult the procedure and training manuals drawn up by Price Waterhouse Associates in 1977 on "Maintenance Costing and Planned Maintenance" and "Stores Recording and Stock Control" to avoid conflict with those procedures that have been adopted by SPA.

8.0 SUGGESTED TEACHING AIDS

- o Chalkboards, newsprint pad, etc.
- o Slides and, if possible, motion pictures.
- o Samples, etc.

APPENDIX C

OUTLINE OF TRAINING COURSE FOR EQUIPMENT MAINTENANCE PERSONNEL

1.0 ORGANIZATION AND DURATION

- o Classroom instruction: 3 days (instruction to be kept to a minimum necessary for giving the basic knowledge required for a proper performance of the maintenance work).
- o On-the-job training: 20 days (to be scheduled in accordance with the execution of the construction works).
- o Performance evaluation and certification: 4 days.

2.0 TRAINEE'S BACKGROUND (Estimated number of trainees: 20)

- o Skilled workers and equipment operators with little or no English.
- o Most of the workers might have gained their skills through apprenticeship and might not have had any formal training.

3.0 PARTICULAR REQUIREMENTS FOR THE TRAINING COURSE

Maintenance techniques should fit in with the Port Authority's maintenance equipment.

4.0 PROGRAM

4.1 Maintenance of Movable Equipment

- o Land-based equipment: mobile cranes, forklift trucks, tractors, trailers, trucks, motor cars.
- o Floating equipment: dredge, tug boats, launches, barges and pontoons.

4.1.2 Training Subject Matters

- o Daily servicing (checklists for operators and mechanics, and techniques): battery check, oil and water checks, oiling and greasing, other routine checks (fluid level in brake, clutch and other hydraulic systems, tire pressure, loose nuts and bolts, etc.) and overall visual inspection.
- o Scheduled preventive maintenance (maintenance cycles, checklists and techniques): oil change, filter change, greasing, replacement of points, spark plugs and other routine parts, inspection of controls (steering, brakes, hydraulic controls, gears, clutch, throttle, lights, horn, indicators, instruments, etc.) and essential parts (slackness of lift chains, wear and tear of cables, condition of fork and attachments, wheel bearings, etc.), performance tests, etc.

- o Operating practices for minimizing maintenance and repair costs and preventing accidents (good driving practices, wearing hard hat and other protective gear, position of forks when driving, driving on slopes, use of commands, continual listening and looking for signs of malfunction, etc.).
- o Keeping of log book: record daily essential information (time of checking out and time of return, hour-meter readings, stoppages or beakdowns, location of work, working conditions, accidents and hazards, etc.).
- o Safety measures: wearing protective gear, measures for preventing accidents, eliminating or minimizing hazardous conditions.

4.2 Maintenance of Fixed Equipment

4.2.1 Equipment to be Covered

- o Electrical and lighting system: generators, transformers, distribution lines, light fixtures.
- o Potable water system: pumps, filters, valves, metering system.
- o Fire protection system: seawater pumps, valves, hydrant and hose system, extinguishers (carbon dioxide, dry chemical, foam), fire alarm system, fire truck, fire boat.

- o Navigation lights: electric lights, flashers, lampchangers, sunvalves, batteries.
- o Electric appliances: air conditioners, refrigerators, cookers, etc.
- o Diesel and gasoline engines.
- o Electric motors and panels.

4.2.2 Training Subject Matters

- o Routine servicing (checklists and techniques).
- o Scheduled preventive maintenance (maintenance cycles, checklists, and techniques).
- o Operating techniques for minimizing maintenance and repair costs.
- o Safety measures: wearing protective gear, measures for preventing accidents, eliminating or minimizing hazardous conditions.

5.0 SUGGESTED TRAINING TECHNIQUES AND PROCEDURES

5.1 Classroom Instruction

- o Use a competent technician (preferably a senior technician assigned by SPA) to translate the training manual and interpret throughout the instruction process.
- o Explain the subject slowly and have the interpreter translate to the trainees after each sentence or small group of sentences.
- o Use audio/visual aids extensively.
- o Follow closely the training manual (prepared by the trainer and translated).
- o Make sure (by questions and answers) the explained topic has been thoroughly understood by all trainees before going on to the next topic.
- o If necessary, the instruction period could be extended.
- o If possible, make on-site demonstrations of the concepts being explained (in spite of the fact that the trainees will have subsequent on-the-job training).
- o Summarize the important points at the end of each session.

5.2 On-the-Job Training

- o Demonstrate the techniques for performing the task with safety (using preferably the equipment that will be used and/or maintained by the trainees).
- o Have the trainees repeat the techniques under the guidance of a supervisor.
- o Have the trainees perform the task with no guidance and check the results.
- o Have the trainees work with the construction contractor's maintenance personnel in the maintenance and repair of the construction equipment.

6.0 FORMAT OF THE TRAINING MANUAL

(To be handed out to trainees in the first session of the training course for use during the training period and for later reference.)

- o Use illustrations and cartoons extensively.
- o Reduce text to a minimum. Use concise, easily understandable English and Somali.
- o Subdivide sections by discipline or type of equipment.

- o Use preferably loose leaf binder.

7.0 COMPOSITION OF TRAINING MANUAL

Besides a preface, the training manual will have four sections of instructions with self-test quizzes at the end of each section.

- A. General background (types, operating principle, etc.).
- B. Specific knowledge of the equipment the trainees will be working with (brief description, main characteristics, capacity, attachments, lubricating points, points to be checked).
- C. How to perform the job: technique, materials, and tools to be used, maintenance frequencies and checklists, operating techniques to minimize maintenance and repair costs, safety measures).
- D. Summary - Do's and Don't's: concise summary of important aspects of previous sections (extensive use of cartoons advisable).

8.0 SUGGESTED TEACHING AIDS

Chalkboard, newsprint pad, etc.

Slides and, if possible, motion pictures (movie or video).

Tools, machine parts, material samples, etc.

9.0 PERFORMANCE EVALUATION AT THE END OF THE COURSE

o Written Test

- Use "true or false" and/or "multiple choice" type of tests.
- Prepare test sheets in English and Somali.
- Carry out the tests with the assistance of an interpreter.

o Performance Test

- Carry out test with a representative of SPA or the Port Management.
- Have the trainees perform the tasks they have been trained for.

o Record Keeping

Transfer test results to the SPA for record keeping.

o Certification

It is desirable to deliver a certificate of achievement to successful trainees, duly signed by SPA officials and instructors.

APPENDIX D

OUTLINE OF TRAINING COURSE FOR CIVIL/STRUCTURAL MAINTENANCE PERSONNEL

1.0 ORGANIZATION AND DURATION

- o Classroom instruction: 3 days (instruction to be kept to a minimum necessary for giving the basic knowledge for a proper performance of the maintenance works).
- o On-the-job training: 20 days (to be scheduled in accordance with the execution of the construction works).
- o Performance evaluation and certification: 4 days.

2.0 TRAINEE'S BACKGROUND (Estimated number of trainees: 15)

- o Skilled workers with little or no English.
- o Most of the workers might have gained their skills through apprenticeship and might not have any previous formal training.

3.0 PARTICULAR REQUIREMENTS FOR THE TRAINING COURSE

Maintenance and repair techniques should fit with the Port Authority's maintenance equipment.

4.0 PROGRAM

4.1 Maintenance of Marine Structures

4.1.1 Structures to be Covered

Rubble mound breakwater, steel sheetpile quay wall with cathodic protection system using sacrificial anodes, fendering system, mooring dolphins, fixed concrete Ro/Ro ramp.

4.1.2 Training Subject Matters

Scheduled inspections, preventive maintenance and repairs (inspection cycles, checklists, and maintenance and repair techniques), safety measures.

- o Inspection for corrosion, loose bolts, cracked weld points, etc., particularly at splash zone and underwater section, by diver (Kismayo Port should have at least one of its Civil/Structural staff trained as a scuba diver).
- o Techniques, equipment and materials to be used for maintenance and repair works: welding, recoating, repainting, jacketing, etc.
- o Inspection, assessment of effectiveness of the cathodic protection system, corrective measures and maintenance.
- o Maintenance of marine hardware.

- o Concrete inspection and repairs: corrosion stains, chloride and sulphate attack, aggregate reaction, breakage, cracking, spalling.
- o Breakwater inspection and maintenance.
- o Safety measures to prevent accidents.

4.2 Maintenance of Roadways and Pavement (Portland cement concrete)

4.2 1 Training Subject Matters

- o Scheduled inspections (inspection cycles, checklists).
- o Preventative maintenance repair: techniques, materials, tools and equipment for patching; filling and sealing of cracks and joints; resurfacing, coating for protection against damage caused by salt.
- o Attention should also be paid to surface drainage, traffic signs, and striping and marking of roadways and terminal areas.
- o Safety measures to prevent accidents.

4.3 Maintenance of Port Buildings

4.3.1 Structures to be Covered

Transit sheds with cinder block walls and corrugated asbestos cement roofing, masonry/concrete administration building, miscellaneous buildings of same construction type as the transit sheds.

4.3.2 Training Subject Matters

Scheduled inspections, maintenance and repairs (inspection cycles, checklists, and maintenance and repair techniques).

Particular attention will be paid to the following:

- o maintenance of cargo doors: greasing of wheels and rails, repairing damage, protective painting, protection against damage by handling equipment.
- o repair and replacement of roofing materials and skylights, maintenance and replacement of roofing fasteners.
- o inspection and maintenance of flashings, roof drains, gutters, use of drain guards and strainers.
- o maintenance of insulated buildings.

- o safety measures to prevent accidents.

4.4 Maintenance of Utilities

Training subject matters: inspection cycles and checklists, maintenance and repair techniques.

4.4.1 Potable Water System

Areas of particular attention: leakage detection by sectional metering and use of hydrophone, replacement and protection of faulty pipe sections and fittings to prevent loss of water and weakening of subgrade that could cause failure of pavement. Water treatment equipment.

4.4.2 Sanitary Sewage System

Areas of particular attention: maintenance of septic tanks, removal and prevention of stoppages in the system, cleaning of traps, periodic flushing of pipelines, removal of sand and grit by sewer brushes and buckets.

4.4.3 Storm Drainage System

- o Surface flow: sealing of pavement cracks and joints to prevent water seepage causing weakening of subgrade; eliminating of water ponding by filling and raising depressed pavement areas through concreting or pressure grouting, and/or providing outlets for ponded water.

- o Ditches and drains: cleaning of drainage ditches and culverts; repairs of damages caused by traffic, settlement, and earth pressure.
- o Safety measures to prevent accidents.

4.4.4 Electric Distribution and Lighting System

Maintenance of light poles, power line ducts, conduits and manholes.

4.4.5 Navigational Aids System

Areas of particular attention:

- o periodic checking and correcting location of buoys, particularly after storms.
- o changing of batteries, gas cylinders, light bulbs, flashers, lamp changers.
- o maintenance of buoys and chains, shore light supports and shore marks.
- o safety measures to prevent accidents.

4.4.6 Fire Protection

Checking and maintenance of fire protection and fighting system:

- o smoke detectors, alarm system.
- o hydrant and hose system.
- o fire extinguishers (carbon dioxide, dry chemical, foam).
- o posting of instructions, warning signs, fencing.
- o fire truck and fire boat.
- o organization of fire fighting, fire drills.

Special attention should be paid to the POL installation and storage facilities.

4.7 Safety rules and measures

Areas of particular attention: wearing of protective gear; safety measures to take when working; posting of safety signs and cartoons; safety inspection.

5.0 SUGGESTED TRAINING TECHNIQUES AND PROCEDURES

Same as for training course for equipment maintenance (Appendix C).

6.0 FORMAT AND COMPOSITION OF THE TRAINING MANUAL

Same as for and can be obtained with the training course on equipment maintenance in one single manual.

7.0 SUGGESTED TEACHING AIDS

Same as for the training course on equipment maintenance.

8.0 PERFORMANCE EVALUATION

Same as for the training course on equipment maintenance.

Memorandum

SOMALI PORTS AUTHORITY
PROCEDURE AND TRAINING MANUAL
MAINTENANCE COSTING AND PLANNED
MAINTENANCE

SOMALI PORTS AUTHORITY

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SOMALI PORTS AUTHORITY

PROCEDURE AND TRAINING MANUAL

MAINTENANCE COSTING AND PLANNED MAINTENANCE

Introduction

- 1 Maintenance costing and planned maintenance systems have been developed for the Somali Ports Authority. The systems have been implemented at the Port of Mogadishu where SPA staff and port employees have been fully trained to introduce the detailed procedures into the other ports.
- 2 The purpose of this procedure and training manual is to provide a record of the detailed procedures for:
 - (1) Recording and charging the direct labour cost of maintenance to cost centres and to the cost record for each individual capital asset
 - (2) Formulating a plan for the maintenance of capital assets.

The structure of this manual

- 3 The procedures for operating the maintenance costing and planned maintenance systems are all described in detail in Procedure Instructions 9 to 26 attached to this manual; these Procedure Instructions have been issued to all relevant staff. The remainder of this introductory section of the manual contains a brief outline of the systems to serve as an initial training guide for new staff and managers.

The purpose of maintenance costing

- 4 The primary purpose of a maintenance costing system should be to determine the actual cost of carrying out repairs to assets. These actual costs of repairs should provide management with information which should be used to:
 - (1) Provide the basis for formulating budgets for the maintenance section
 - (2) Exercise control over the cost of operating the maintenance section
 - (3) Provide the basis for the estimating of the cost of new maintenance jobs
 - (4) Determine the cost of maintaining individual assets or groups of assets.
- 5 A secondary purpose of the maintenance costing system which was designed for the Somali Ports Authority is to provide information required to allocate direct maintenance costs to the cost centres developed for the tariff based costing system.

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BRIEF SUMMARY OF THE MAINTENANCE COSTING SYSTEM

System outline

- 6 In order to fulfill the purposes of a maintenance costing system, procedures were introduced to provide the means of identifying the asset which was repaired, recording the actual hours taken by engineering personnel to complete the task, and to specify the work involved in carrying out the repair. Procedures were also introduced in order to determine the costing rate per hour which should be applied to the hours recorded by the engineering personnel for each job. The procedures involved are summarised below:

(1) All engineering jobs should be recorded in a register and given a unique job number (see Procedure Instruction No 9)

(2) Job cards are prepared for the trade which should carry out the task, and the unique job number should be entered on the job card. The job cards should be issued to the foremen who should record on the job cards the actual man hours taken to complete the task (see Procedure Instruction No 10)

(3) The daily hours should be analysed to ensure that the total hours incurred on job cards conform to the payroll hours (see Procedure Instructions No 11)

(4) The man hours recorded on job cards should be analysed by cost centre and job number (see Procedure Instruction No 12)

(5) The average direct labour cost per hour should be calculated directly from the payroll (see Procedure Instruction No 13)

(6) The man hours recorded for each job should be multiplied by the cost rate per hour and the costs of each job carried out within each cost centre should be added together to give the direct maintenance labour cost by cost centre (see Procedure Instruction No 14).

Agreement of job cards and total payroll

- 7 At SPA it was necessary to introduce a method of comparing the total labour cost of maintenance calculated from the job cards with the total payroll costs to ensure that all payroll costs had been accounted for. In order that the causes of difference could be identified the following steps were taken:

(1) Hours are recorded on job cards by engineering trade

(2) The payroll has been reorganised so that the total wage for each trade can be identified directly from the payroll

(3) The average labour cost per hour is calculated each month for each trade directly from the payroll

(4) The labour hours are analysed and costed by trade.

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- 8 It is now possible to compare the labour costs for each trade calculated from the job cards directly with the corresponding payroll costs and to identify where major discrepancies have occurred.
- 9 Provided Procedure Instruction Number 11 is followed, discrepancy between payroll costs and the costs calculated from job cards can be kept within acceptance limits. This procedure requires that available hours for each trade are determined from the attendance records, the overtime hours are prepared weekly and the total attendance hours are compared with the total hours recorded on job cards. Where differences occur, these differences should be analysed and corrected before the labour cost analysis forms are sent to the costing section. The differences between the payroll costs and the cost calculated from job cards can be caused as follows:

(1) Personnel are paid their total wage for basic hours even when they are absent, the job card however, should record actual attendance hours. In order that the payroll and the job card costs agree, the differences between the attendance hours and the paid hours should be recorded separately and it is recommended in the Procedure that these hours are recorded under the heading of No Work Available.

(2) Overtime payments are restricted to a maximum of 60 hours per month, however at the discretion of Heads of Sections the overtime hours paid for can be reduced where personnel have been absent or are late starters. The overtime hours recorded on job cards should therefore be adjusted to conform to the actual overtime paid

(3) Errors can be made by the foremen when they are recording the hours on job cards. When it is evident that over-booking or under-booking has occurred the matter should be referred directly to the foreman and the hours adjusted before the analysis forms are sent to the costing section.

BRIEF SUMMARY OF THE PLANNED MAINTENANCE SYSTEM

The purpose of planned maintenance

- 10 The purpose of a planned maintenance system is primarily to ensure that assets are regularly inspected and serviced and so reduce the incidence of crisis maintenance. Only in this way can capital assets be kept in such a state of repair that they are available for immediate use by the Authority. Planned maintenance has therefore been introduced at SPA in order to reduce the incidence of breakdowns of mobile and afloat craft, which interrupts the achievement of the cargo handling plan and to enable the Authority to plan and budget for the repairs to civil engineering assets.

Mobile assets and afloat craft

- 11 The method adopted for preparing the maintenance plan for mobile assets and afloat craft is briefly described below:

(1) Manufacturers' maintenance manuals were examined and the recommended frequency of inspection for the determination of deterioration or a part replacement were recorded

(2) The manufacturers' recommendations were discussed with the SPA engineers and the recommendations were modified to comply with local conditions

(3) Job cards were prepared in which were specified the inspections to be carried out or the parts to be replaced and the number of times each card should be issued in a year. Each card was also given a unique identification number

(4) A wall plan was prepared on which each of the mobile plant and afloat craft were recorded and against each item of plant the planned maintenance job card numbers to be issued during the month were entered

(5) Each month therefore the planned maintenance job cards which specify the inspection or part change which apply to a particular plant should be issued to the foreman, and the inspection for deterioration or the changes to parts recommended by the engineers carried out at the frequency necessary to maintain the asset in a reasonable condition.

Civil engineering assets

12 The repairs required to maintain civil engineering assets can be determined and specified after inspection by a competent and experienced civil engineer. The civil engineering maintenance procedure therefore prepared for SPA requires that:

(1) A competent civil engineer examines each of the civil engineering assets at least once per year

(2) The engineer specifies the repair required and prepares an estimate of the cost of each repair

(3) A job card is prepared and issued to the maintenance engineer in which the work to be carried out is specified

(4) A plan is prepared in which the start date and duration time for the repair is determined.

SUMMARY OF PROCEDURES

13 In the remaining paragraphs of the introduction to the training manual a brief summary is given of the eight main procedures contained in the manual. The detailed procedures are attached together with illustrations of the documents concerned.

PROCEDURE INSTRUCTION NUMBER 9

Maintenance of a job register

14 The method of preparing a maintenance job register is set out in Procedure Number 9. The purpose of the job register is to:

(1) Provide the means of giving a unique number to each job and thus provide a simple and convenient method of identifying the labour hours used with a defined job

(2) Record the trade which carried out the work so that a costing rate per hour can be calculated directly from the payroll

(3) Provide the means of identifying the capital asset which was repaired so that the cumulative cost of repairing an individual asset can be recorded

(4) Provide the means of controlling the issue and receipt of job cards.

PROCEDURE INSTRUCTION NUMBER 10

Preparation and completion of job cards

- 15 In Procedure Number 10 the method of preparing and issuing job cards to engineering foremen is set out in detail. The procedure specifies, that a job card should be prepared for each of the trades involved in carrying out the task, that a job number should be entered on each of the job cards, it also describes the method of recording the number of personnel and the hours spent by each of the personnel to complete the task, and how the calculation of the total man hours is carried out.

PROCEDURE INSTRUCTION NUMBER 11

Analysis of daily hours

- 16 Procedure Instruction Number 11 is concerned with the method which should be followed in order to ensure that the total cost of maintenance calculated from the hours recorded on job cards reconciles with the corresponding payroll costs. Provided this procedure is followed it should be possible to reduce the divergence between the payroll costs and the maintenance costs calculated from job cards to within reasonable limits. The procedure specifies that:

(1) The attendance hours for each trade should be established from the attendance records each day

(2) The number of hours for which an employee will be paid when absent should be established each day and recorded under a specified heading

(3) The overtime hours payable to each employee for each trade should be established each week

(4) The total hours recorded by each trade on the job cards should be compared with the available hours plus overtime hours, if there is a difference, the reason should be established, and an adjustment made to correct the difference.

- 17 Provided this procedure is followed the hours recorded on the weekly analysis sheets (see Procedure Number 12) should include:

- (1) Available hours which are the hours during which an employee was available for work
- (2) The overtime hours for which an employee will be paid
- (3) The normal hours during which an employee was absent and for which he will be paid his basic wage.

PROCEDURE INSTRUCTION NUMBER 12

The analysis of engineering hours by cost centre and job number

- 18 In Procedure Instruction Number 12 the method which should be followed to analyse civil and mechanical engineers hours by cost centre and job number is set out. An analysis form should be prepared for each trade and the hours recorded for each job under the cost centre description provided on the form. This information will be used to determine the direct maintenance labour costs by cost centre and job number.

PROCEDURE INSTRUCTION NUMBER 13

Calculation of the average direct maintenance and labour cost per hour

- 19 Procedure Instruction Number 13 describes the method which should be followed in order to establish the average labour cost per hour for each trade. The engineering normal and overtime payrolls have been reorganised into sections corresponding to each trade, the total wages paid to each trade can therefore be obtained directly from the payroll, the average labour costs per hour for each trade can be calculated by dividing the total wages paid to each trade by the hours worked by each trade.

PROCEDURE INSTRUCTION NUMBER 14

Calculating the direct labour maintenance cost by cost centre and job number

- 20 In Procedure Instruction Number 14 the method of calculating the direct maintenance labour cost by cost centre and job number is set out. The procedure explains that the direct labour hours recorded on the weekly analysis form (see Procedure Number 12) are multiplied by the average labour cost per hour (see Procedure Number 13) so that the direct labour cost by cost centre and job number can be derived.

PROCEDURE INSTRUCTION NUMBER 24

Maintenance costs records

- 21 In Procedure Number 24 the procedure for preparing a record of the cost of maintaining mobile capital assets is set out. Briefly the asset which has been repaired can be determined from

the job number and the job register. The labour cost of repair can be determined from the weekly analysis of maintenance costs. This information is entered on the record which has been prepared for each of the mobile assets and when added to the material cost which can be determined from goods issued note, the cumulative cost of repairs for each asset can be maintained.

PROCEDURE INSTRUCTION NUMBER 25

Civil engineering maintenance inspections

22. Procedure Instruction Number 25 is concerned with the method of determining the repairs which are required to be carried out in order to maintain the Authority's civil engineering assets in a reasonable state of repair. The procedure sets out the method which should be followed by a qualified civil engineer to carry out a detailed inspection of each of the fixed assets at each port, and when the nature of the repair is established to estimate the cost of the repair. The procedure describes the method of recording the actual cost of the repair and comparing the actual cost with the original estimate.

PROCEDURE INSTRUCTION NUMBER 26

Preparation of a maintenance plan

23. Procedure Number 26 sets out the method of preparing a plan in order that the inspection of assets or part replacements are carried out as recommended by the port engineers. The plan prepared for the engineering sections at Mogadishu Port indicates the weeks and the month during which the planned maintenance job card should be issued.

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 9

PROCEDURE INSTRUCTION FOR MAINTAINING THE JOB REGISTER

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 9

PROCEDURE INSTRUCTION FOR MAINTAINING THE JOB REGISTER

PURPOSE OF THE INSTRUCTION

- 1 The purpose of these instructions is to describe the method which must be followed to maintain an up to date record of jobs to be carried out by the civil and mechanical engineers and to allocate a job number to each job. The job number allocated will be used to record the labour cost by cost centre for the tariff based costing system and by job for the maintenance costing system.

RESPONSIBILITY

- 2 The register will be maintained up to date by the clerical assistant appointed by the mechanical and civil engineers.

DOCUMENTATION

- 3 The job register will be used to record work to be carried out by the mechanical and civil engineering section. It will be kept on the form called REGISTER OF JOBS, an example of which is attached as statement 1.

SOURCE OF INFORMATION

- 4 The source of information will be verbal requests for crisis maintenance and repairs, or written request or planned maintenance job cards.

INSTRUCTIONS

- 5 As each job is requested enter the following information in the register:
 - (1) The job number which will be the next number in the sequence in column (1). All civil engineering job numbers will be given the prefix C
 - (2) Enter the request number or the names of section making the request in column (2)
 - (3) Enter a brief description of the work requested in column (3)
 - (4) Enter the trade description of the personnel who will complete the job in column (4)
 - (5) Enter the date the work was issued in column (5)
 - (6) Enter the date the work was completed in column (6).

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PROCEDURE INSTRUCTION NUMBER 10

PROCEDURE INSTRUCTION FOR THE PREPARATION AND COMPLETION
OF JOB CARDS

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 10

PROCEDURE INSTRUCTION FOR THE PREPARATION
AND COMPLETION OF JOB CARDS

PURPOSE OF THE INSTRUCTION

- 1 The purpose of these instructions is to describe the method which must be followed in order to prepare job cards which are working instructions for issue to the foreman in charge of the sections. The instructions also describe the procedure which should be followed to record the directed labour hours of each trade, this information will be used by the accounting section to allocate maintenance hours to cost centre for the tariff based costing system and also to calculate the cost of maintenance.

RESPONSIBILITY

- 2 The job cards will be prepared and issued by the clerical assistants appointed by the civil and mechanical engineers.

The information concerning the maintenance work used on each job will be obtained by the technical assistant appointed by the civil and mechanical engineers.

DOCUMENTATION

- 3 The job card will be used to describe the work to be completed, and to record the direct labour hours which were used to complete the job.

SOURCE OF INFORMATION

- 4 The source of information concerning the job number and work description will be the job register. The source of information concerning the hours worked will be the foremen responsible for each section.

INSTRUCTIONS

- 5 Instructions concerning the preparation of the JOB DESCRIPTION part of the job card are as follows:

(1) Enter the job number from the job register in column (1)

(2) Enter the trade of the personnel carrying out the work in column (2)

(Note: Some trades work with assistants, for example a mason will work with an assistant, it is necessary to describe only the principal trade)

(3) Under column (3) enter a technical description of the work to be carried out

- (4) In column (4) enter the date and time the work started
- (5) In column (5) enter the date and time the work was completed.

- 6 Instruction concerning the preparation of the job description part of the job card to carry out planned maintenance of the mechanical plant and equipment are as follows:

Note: Planned maintenance job cards will already have detailed job descriptions printed on the cards

- (1) Obtain the job register
- (2) Find out the next unused job number and add the prefix P
- (3) Briefly describe the planned maintenance job in the job register indicating the plant number and type of periodic maintenance to be carried out

Example: Six monthly maintenance of Jones Crane number.....

- (4) Enter the job number on the job card allocated prefixed by P in column (1)
- (5) Enter the date and time of issue in column (4)
- (6) Enter the date and time the job was completed in column (5).

- 7 The instructions concerning the recording of mechanical engineering maintenance hours are as follows:

- (1) The technical clerk will visit each departmental foreman each day
- (2) He will ascertain from the foreman:
 - a the number of the workmen who worked on the job the previous day
 - b the number of hours they worked
 - c whether or not the work was completed
- (3) He will enter the days date in column (6)
- (4) He will enter the number of the workers employed on the job in column (7)
- (5) He will enter the number of hours worked in column (8)

(6) He will calculate the man hours by multiplying column (7) by column (8) and entering the product in column (9).

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PROCEDURE INSTRUCTION NUMBER 10
(front of form)

JOB CARD

JOB CARD		_____ JOB NUMBER (1) _____ _____	
TRADE (2) _____			
DESCRIPTION OF WORK (3)			
START (4)		COMPLETED (5)	
DATE	TIME	DATE	TIME

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 10
(back of form)

JOB CARD

DATE	NUMBER OF EMPLOYEES	ACTUAL HOURS WORKED	TOTAL MAN HOURS
(6)	(7)	(8)	(9)
TOTAL			

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NO 11

PROCEDURE INSTRUCTION CONCERNING THE ANALYSIS OF DAILY HOURS

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 11

PROCEDURE INSTRUCTION CONCERNING THE
ANALYSIS OF DAILY HOURS

PURPOSE OF THE INSTRUCTION

- 1 Purpose of the instruction is to describe the method which must be followed in order to ensure that the hours recorded on the job cards are equal to the hours recorded for wage payment.

RESPONSIBILITY

- 2 The analysis will be carried out by the clerical assistant responsible for the control of job cards.

DOCUMENTATION

- 3 An analysis form will be used by the clerical assistant to compare the hours recorded on job cards with the hours signed for by the employees.

SOURCE OF INFORMATION

- 4 The source of information will be the job cards and the record of hours signed for by the employees.

INSTRUCTIONS

- 5 The clerical assistant, will, each day:
 - a enter the day and the date at column (1)
 - b from each job card, enter the job number at column (2)
 - c enter from each job sheet the man hours recorded by the section for each job number
 - d total the hours for each section and enter the sum in column (3)
 - e from the record signed by the employees, ascertain the total hours worked by each section which will be the total number of employees in the section multiplied by the hours worked by the section. Enter the hours in column (4)
 - f he will calculate the difference between the hours recorded on the job cards and total hours recorded, that is column (3) minus column (4). Enter the difference in column (5), negative difference will be in brackets
 - g provided column (4) is greater in value than column (3), the difference will be entered as 'No work available' in column (19) of the weekly analysis of mechanical engineers maintenance labour.

h when column (4) is less in value than column (3), the section has overbooked the hours worked, the clerk will obtain the correct hours from the foreman in charge of the section.

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PROCEDURE INSTRUCTION NUMBER 12

PROCEDURE INSTRUCTIONS FOR THE ANALYSIS OF ENGINEERING HOURS
BY COST CENTRE AND BY JOB NUMBER

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PROCEDURE INSTRUCTION NUMBER 12

PROCEDURE INSTRUCTION FOR THE ANALYSIS OF
ENGINEERING HOURS BY COST CENTRE AND BY JOB NUMBER

PURPOSE OF THE INSTRUCTION

- 1 The purpose of the instruction is to describe the method which should be followed in order to analyse the civil and mechanical maintenance section direct labour hours by cost centre and job number. This analysis, when costed, will provide cost of maintenance by cost centre for the tariff based costing system, and the cost of maintaining specific plant for the maintenance costing system.

RESPONSIBILITY

- 2 The clerical assistant appointed by the civil and mechanical engineers will be responsible for analysing the direct labour hours.

DOCUMENTATION

- 3 The analysis forms attached to this instruction will be used to record the direct labour hours by cost centre and job number. The forms are illustrated in Statements 1 and 2 of this instruction.

SOURCES OF INFORMATION

- 4 Direct labour hours will be obtained from the job cards.

INSTRUCTIONS

- 5 The clerical assistant will complete an analysis form for each trade or group of maintenance employees each week. A trade is a group of employees who carry out the same or similar duties. All the present maintenance employees are organised into the following groups.

Civil engineering

- a masons, bricklayers and general builders
- b electricians
- c concrete mixers
- d block makers

Mechanical engineering

- a blacksmiths, metal workers and welders, repair afloat craft
- b woodworkers and joiners
- c machine shop personnel
- d crane mechanics
- e motor mechanics

- f motor electricians and battery chargers
- g tyre repairers
- h painters

6 The clerical assistant will prepare the analysis forms as follows:

(1) Enter the week ended date at (1)

(2) Enter the trade description at (2)

(3) Enter the job card number at (4)

(4) Enter on the weekly analysis of mechanical engineering maintenance, the hours required to maintain or repair the following:

a launches, lighters and afloat craft used for cargo handling in column (5)

b tug boats in column (7)

c dredgers in column (9)

d pilot boats in column (11)

e mobile plant used for cargo handling in column (13)

f port vehicles in column (15)

g SPA headquarters vehicles in column (17)

h enter the hours during which the employees had no work to do or the hours not recorded on job cards (see instruction number 10, paragraph 5, sections g and h.

(5) Enter on the weekly analysis of civil engineering maintenance the hours required to repair or maintain the following:

a navigation aids in column (5)

b breakwaters in column (7)

c quays, dolphins and piers in column (11)

d transit sheds in column (11)

e port services and offices in column (13)

f SPA offices and work carried out for other agencies in column (15)

g enter the hours during which employees had no work to do or the hours not recorded on job cards, see instruction number 10, paragraph 5, sections g and h

(6) Enter the total available hours for the section from the weekly analysis information, see procedure instruction 10.

(7) The clerical assistant will send three copies to the port accountant and retain one copy for his files.

SOMALI PORTS AUTHORITY

WEEKLY ANALYSIS OF MECHANICAL ENGINEERING MAINTENANCE

DATE (1) _____

TRADE (2) _____

COSTING RATE PER HOUR (3)

JOB NO	LAUNCHES LIGHTERS		TUG BOAT		DREDGER		PILOT PORT		FORK LIFTS CRANES		VEHICLES		NO WORK AVAILABLE			
	HRS	TOTAL COST(6)	HRS	TOTAL COST(8)	HRS	TOTAL COST(10)	HRS	TOTAL COST(12)	HRS	TOTAL COST(14)	HRS	TOTAL COST(16)	HRS	TOTAL COST(18)		
4	5		7		9		11		13		15		17		19	
TOTAL																

TOTAL AVAILABLE HOURS (12)
X

DISTRIBUTION
1) PORT MANAGER
2) PORT ACCOUNTANT

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SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 13

PROCEDURE INSTRUCTION FOR CALCULATING THE AVERAGE DIRECT
MAINTENANCE LABOUR COST PER HOUR

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 13

PROCEDURE INSTRUCTION FOR CALCULATING THE AVERAGE DIRECT
MAINTENANCE LABOUR COST PER HOUR

INTRODUCTION

- 1 In order to carry out the instructions, the normal and overtime payroll should be analysed by trade and occupation. Instructions concerning the organisation of the payroll were prepared by the consultant and issued to the port accountant.

PURPOSE OF THE INSTRUCTION

- 2 The purpose of the instruction is to describe the method which must be followed in order to calculate the average maintenance direct labour cost per hour.

RESPONSIBILITY

- 3 The average direct labour maintenance cost per hour will be calculated by the payroll section of each port.

DOCUMENTATION

- 4 The cost per hour will be calculated on the form entitled "CALCULATION OF AVERAGE DIRECT MAINTENANCE COST PER HOUR" which is attached to this instruction as statement 1.
- 5 The source of information for the calculation will be the sections of the payroll in which the maintenance direct labour wages and overtime payments are calculated.

INSTRUCTIONS

- 6 The calculation of the maintenance direct labour cost of normal hours must be made as follows:
 - a) after a wage increase
 - b) after personnel have been added or removed from the section
 - c) after a change in normal working hours.
- 7 Prepare 12 forms for each Trade
 - a) enter location at column (1)
 - b) enter trade description at column (2)

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- c) enter name of operatives in column (4)
- d) enter normal monthly hours worked in column (5)
- e) from payroll enter the monthly wages in column (7)
- f) add column (5) Enter sum in column (9)
- g) add column (7) Enter sum in column (11)
- h) divide sum in column (11) by sum in column (9) to calculate the average normal maintenance direct labour cost for each trade. Enter the answer in column (13).

8 The instructions concerning the calculation of the total average maintenance direct labour cost are given below. Each month obtain a form for each trade on which the average normal maintenance direct labour cost has been calculated.

- a) Enter month in column (3)
- b) If there is a difference between the hours or the wages recorded on the form
 - 1) Enter the amount recorded on the payroll in columns (5) and/or (7)
 - 2) Correct the addition in columns (9) and/or (11)
- c) From the overtime payroll enter in column (6) against name in column (4) the overtime hours worked
- d) From the overtime payroll enter in column (8) against each name the overtime wage.
- e) add column (6) enter the answer in column (10)
- f) add column (8) enter the answer in column (12)
- g) add column (9) to column (10) enter the answer in column (14)
- h) add column (11) to column (12) enter the answer in column (16)

9 The average maintenance direct labour cost per hour will be found as follows:

- a) In column 13 provided no overtime has been worked
- b) In column 16 provided overtime has been worked

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CALCULATION OF AVERAGE DIRECT MAINTENANCE COST PER HOUR

LOCATION (1)

MONTH (3)

TRADE OCCUPATION (2)

NAME (4)	MONTHLY NORMAL HOURS (5)	OVERTIME HOURS (6)	NORMAL WAGE PER MONTH (7)	OVERTIME WAGE (8)
TOTAL	9	10	11	12
NORMAL DIRECT LABOUR MAINTENANCE COST PER HOUR COL 11 ÷ Col 9		13		
TOTALS Col 9 + 10 Col 11 + 12		14		15
TOTAL AVERAGE DIRECT LABOUR MAINTENANCE COST PER HOUR INCLUDING OVERTIME COL 15 ÷ Col 14				16

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SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 14

PROCEDURE INSTRUCTION FOR CALCULATING THE DIRECT LABOUR MAINTENANCE
COST BY COST CENTRE AND THE JOB NUMBER

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 14

PROCEDURE INSTRUCTION FOR CALCULATING THE DIRECT LABOUR MAINTENANCE COST BY COST CENTRE AND THE JOB NUMBER

PURPOSE OF THE INSTRUCTION

- 1 The purpose of this instruction is to describe the procedure which must be followed in order that the direct maintenance labour cost is calculated by cost centre for the tariff based costing system and by job number for the maintenance costing system.

RESPONSIBILITY

- 2 The Financial and Administrative Director will determine who will be responsible for calculating the maintenance direct labour costs. (The consultant have recommended that the calculation should be carried out by an accountant responsible to the Port Accountant).

DOCUMENTATION

- 3 The Forms described in the next paragraph will be used; these forms are attached to this instruction.

SOURCE OF INFORMATION

- 4 The direct labour cost per hour will be obtained from the form entitled Calculation of the Average Direct Labour Cost per Hour. See procedure instruction Number 13 also attached to this instruction as statement 1.

The Direct Labour will be obtained from forms entitled weekly analysis of civil engineering maintenance and weekly analysis of mechanical engineering maintenance, see procedure number 12, also attached to this instruction as statements 2 and 3.

INSTRUCTIONS

- 5 Before calculating the direct labour cost by cost centre and job number the average direct labour cost for each trade must be calculated in accordance with procedure instruction number 13 after calculating the average direct labour cost per hour.
 - 1) Enter on the weekly analysis of mechanical engineering maintenance form and on the weekly analysis of civil engineering maintenance form the average direct labour cost per hour for the TRADE (see column (2) of the above forms) in column (3) of the above forms. The average cost per hour for the Trade will be found in column (13) provided no overtime has been worked or column (16) provided overtime has been worked

- 2) Multiply the hours recorded on the weekly analysis forms by the cost per hour as follows:
 - a) Column (5) X Column (3) enter the answer in column (6).
 - b) Column (7) X Column (3) enter the answer in column (8).
 - c) Column (9) X Column (3) enter the answer in column (10).
 - d) Column (11) X Column (3) enter the answer in column (12).
 - e) Column (13) X Column (3) enter the answer in column (14).
 - f) Column (15) X Column (3) enter the answer in column (16).
 - g) Column (17) X Column (3) enter the answer in column (18).
 - h) Civil engineering only, column (19) X Column (3) enter the answer in column (20).
- 3) Add each of the following columns to obtain the direct labour cost per cost centre. (6), (8), (10), (12), (14), (16), (18), (20).
- 4) The cost per job will be obtained from each entry in columns (6), (8), (10), (12), (14), (16), (18), (20).
- 5) The port accountant will retain one copy of the form and send a copy to the port engineer and the port manager.

CALCULATION OF THE AVERAGE DIRECT MAINTENANCE

LABOUR COST PER HOUR

LOCATION (1)

MONTH (2)

TRADE OCCUPATION (2)

NAME (4)	MONTHLY NORMAL HOURS (5)	OVERTIME HOURS (6)	NORMAL WAGE PER (7)	OVERTIME WAGE PER MONTH (8)
TOTAL	(9)	(10)	(11)	(12)
NORMAL DIRECT LABOUR MAINTENANCE COST PER HOUR COL 11 COL 9		(13)	/	
TOTAL COL 9 + COL 10 COL 11 + COL 12		(14)		15
TOTAL AVERAGE DIRECT LABOUR COST PER HOUR INCLUDING OVERTIME COL 15 + COL 14				16

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SOMALI PORTS AUTHORITY
WEEKLY ANALYSIS OF CIVIL ENGINEERING MAINTENANCE

PROCEDURE INSTRUCTION 14
 Statement 3

DATE (1)

TRADE (2)
 COSTING RATE PER HOUR (3)

JOB No	NAVIGATION AIOS		BREAKWATER		QUAYS PIERS DOLPHINS		TRANSIT SHED		PORT SERVICES AND OFFICES		S.P.A. OFFICES OR OTHER AGENCIES		NO WORK AVAILABLE	
	(5) HRS	(6) COST	(7) HRS	(8) COST	(9) HRS	(10) COST	(11) HRS	(12) COST	(13) HRS	(14) COST	(15) HRS	(16) COST	(17) HRS	(18) COST
(4)														
TOTAL														

HOURS AVAILABLE

DISTRIBUTION
 (1) PORT MANAGER
 (2) PORT ACCOUNTANT

1/2

SOMALI PORTS AUTHORITY

PROCEDURE NUMBER 24

MAINTENANCE COST RECORD

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 24

MAINTENANCE COST RECORD

PURPOSE OF THE INSTRUCTION

- 1 The purpose of the instructions is to describe the method of completing the maintenance cost record card which should be used by the mechanical engineer to control maintenance cost for each asset.

RESPONSIBILITY

- 2 The engineering clerk will be responsible for completing the maintenance cost record.

DOCUMENTATION

- 3 The cost of maintenance for each asset will be recorded on the maintenance cost record.

SOURCE OF INFORMATION

- 4 Information concerning material cost will be obtained from the analysis of material issues prepared by the accounts section at S.P.A. and labour costs from the valued labour analysis form.

INSTRUCTIONS

5 Instruction concerning preparation of records:

- 1) Enter asset details at (1), sufficient detail should be entered to describe the plant.
- 2) Enter the plant number at (2).

6 Instructions concerning the recording of costs:

- (1) Enter the job number at (3)
- (2) Enter material cost details at (4)
- (3) Enter labour cost details at (5)
- (4) Add material and labour cost enter the sum at (6)
- (5) Add the cost at (6) to the previous entry at (7) to calculate the cumulative cost.

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FILING

- 6 File each record by plant number within plant type.

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 25

CIVIL ENGINEERING MAINTENANCE INSPECTION

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 25

CIVIL ENGINEERING MAINTENANCE INSPECTION

PURPOSE OF THE INSTRUCTION

- 1 The purpose of these instructions is to describe the method which should be followed in order that port structures, roadways, quays and buildings are inspected at least once per year in order to determine the maintenance repairs required.

RESPONSIBILITY

- 2 The civil engineer employed by the Authority will be responsible for carrying out inspection and estimating cost of repairs.

DOCUMENTATION

- 3 The form entitled Port Structures and Buildings Inspection will be used to record the repairs required and estimated cost of the repair. An example of the form is attached as attachment 1.

SOURCES OF INFORMATION

- 4 Sources of information concerning material cost will be ONAT or any agency supplying raw materials. Sources of information concerning average labour rates will be the civil engineering payroll. Asset number and description will be obtained from the asset ledger.

INSTRUCTION

- 5 (1) Obtain the SPA headquarters copy of the asset register
(2) Enter the port at column (1) of the form given in attachment 1
(3) Find asset groups 1 and 2 in the register
(4) Enter the asset number at (4) for each asset in groups 1 and 2
(5) Enter a brief asset description at (5)
(6) Copy the cost centre code from column (6) of the asset record card into column (6) of the form
(7) Visit the port
(8) Inspect each civil engineering asset
(9) Determine what repair is necessary

(10) Enter the description of the repair in column (7) or if no repair is required enter Nil

(11) Estimate the quality of material required and enter the cost in column (8)

(12) Estimate the labour cost and enter the cost in column (9)

(13) Add the repair details to the job register and enter the job number in column (3)

(15) Issue a job card to carry out the repair

(16) On the back of the form enter the actual material and labour cost. This information will be obtained from the accounts department. Material cost will be obtained from the goods issued issue notes. After the total cost of the goods issued has been calculated, the direct engineering labour cost will be obtained from the analysis of engineering hours by cost centre and job number (see procedure numbers 12 and 13). The detailed entries will be as follows:

Material costs

a enter the date in column (12)

b enter the goods issue note number in column (13)

c enter the material cost from the goods issue note in column (14)

Labour cost

d enter the date of the labour cost analysis form in column (15)

e enter the labour cost from the analysis form in column (16)

f add each entry to the last cumulative cost in column (17) and enter the current cumulative cost.

FILING INSTRUCTIONS

6 Inspection forms will be filed by port in job number order.

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SOMALI PORTS AUTHORITY

SOMALI PORTS AUTHORITY							
PLANNED MAINTENANCE							
PORT STRUCTURES AND BUILDINGS INSPECTION							
LOCATION	1	DATE	2	FORM AND JOB NUMBER	3		
ASSET NUMBER	4	ASSET DESCRIPTION	5	COST CENTRE NUMBER	6		
		ESTIMATED COST					
DESCRIPTION OF REPAIR	7	MATERIAL	8	LABOUR	9	TOTAL	10
TOTAL	11						

SOMALI PORTS AUTHORITY

PROCEDURE INSTRUCTION NUMBER 26

PREPARATION OF MAINTENANCE PLAN

