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# PORT OF DAMIETTA OPERATIONAL EFFICIENCY

## EVALUATION AND RECOMMENDATIONS

April 2008

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# **Port of Damietta Operational Efficiency**

## **EVALUATION AND RECOMMENDATIONS**

TECHNICAL ASSISTANCE FOR POLICY REFORM II

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## **1. Introduction**

Under the Technical Assistance for Policy Reform II Program, a consultant team from Nathan Associates assessed port operations at the Damietta Port Authority (DPA) from February 19 through March 6, 2008. The primary objectives were to

- Recommend ways to improve operating efficiencies;
- Identify and evaluate systemic problems that affect current port operations or that could affect future development and recommend ways to address these problems; and
- Assess policy related to port operations and development and recommend changes if necessary.

Port operations specialist Raymond Lawler and port IT specialist Abdel Meguid Fouad met with Egypt's Deputy Minister of Transportation, Omar Elbakry, to discuss the assessment scope and purpose. They then visited the port at Damietta twice during the study period, meeting with the chairman and senior managers and touring the facilities with port officials to develop a detailed perspective on the IT system and collect detailed statistics and non quantitative data on operations. For comparative purposes, they also toured the Ports of Alexandria and El-Dekheila and discussed operational and development issues with senior managers.

### **PORT OPERATIONAL STRENGTHS**

First impressions of the port at Damietta were very positive. With a minor exception, the impressive state-of-the-art security system meets all USTSA, CSI, and ISPS security requirements for gate processing and the securing of sensitive internal facilities, offices, and operation areas. Visitors' identification is validated against appointment lists, visitors' movements are monitored, and visitors are received by authorized staff and escorted to the persons with whom they have appointments. During the study team's tour, a security vehicle escorted the van provided for touring.

The port's IT system is also modern. A considerable amount has been spent to develop an integrated port management system that includes a gate control and truck booking and monitoring system, a container terminal management system using NAVIS as the primary software, and a general cargo inventory control system. System installation has been underway for about 18 months and the systems integrator has made good progress in installing the key hardware and software and developing customized software for integrating functions. The one major problem is that the RDT system specified for the container terminal does not work as required; consequently, operations are still controlled manually even though NAVIS is available. This is having a significant negative impact on the operation of the container terminal. A proposal for an alternative communication system is being processed.

We were also impressed by the quality and quantity of capital equipment. The Damietta Container & Cargo Handling Company (DCHC), which operates the container terminal, has 6 new post-Panamax quay gantry cranes with 50-56 meter outreach and two older Panamax cranes with a 45-meter outreach. The post-Panamax cranes are backed up by 10 new 40-ton rubber-tired gantry cranes (RTGs) with 2 more on order. This equipment is supplemented by 6 mobile harbor cranes, 6 reach stackers, 18 top picks, and 19 forklifts of varying capacities. The bulk quay has a Siwertell discharger for clinker, large specialized evacuators for handling grain, and hopper conveyor systems for loading dry bulk materials.

It was also clear that the port employs a very competent and highly skilled staff of professionals who know their jobs and are very open to new ideas. These qualities were particularly noticeable among the IT, document processing, operations, and engineering staff. These staff members answered our questions in detail or quickly secured answers from other sources.

### **PORT OPERATIONAL WEAKNESSES**

The tours also revealed several areas that need improvement if the DPA is to fulfill its mission. Our first and general impression is that work on quays and berths proceeds very slowly. This was particularly noticeable at the general cargo berths, where the operators used relatively primitive methods to handle general cargo and employed ship-to-truck delivery systems, one of the slowest ways to discharge a vessel. The operators were also using portable bagging units on the quay to bag grain directly from the ship for loading onto trucks. This procedure nearly triples the time to discharge a vessel. These operations also appeared to be very careless, resulting in much damaged cargo, especially wood products. The bulk handling operations seemed to be more productive but are not yet up to international standards.

The tour of the container terminal also provided a number of surprises. Despite the presence of two fourth-generation container vessels, crane operations and container handling at berths 1 and 2 seemed very slow. Container discharge and stowing and vessel turnaround lacked urgency, and yard operations were also very relaxed. It is possible that we arrived during a scheduled break or when the vessel was waiting to be convoyed out of the port. Even so, terminal layout was not conducive to high efficiency operations. The terminal used two relatively incompatible operating systems—an RTG system associated with the post-Panamax cranes on berths 1, 2, and part of 3, and a reach stacker system primarily associated with berths 3 and 4, with stacks 3-4 wide and 3 high. RTG systems are usually used in high-density, high-throughput operations while reach stackers are used for smaller, low-density operations. They do not mesh well when operating together on a single terminal.

In addition, stack organization could be greatly improved, especially with regard to the service of reefer and the handling of empty containers. These tend to be located in the back of the terminal in a rather disorganized manner that blocks traffic lanes. Discarded junk and out-of-service machinery also clutter the area. For example, an out-of-service RTG was parked at the end of a stack and much junk had accumulated around its base. All in all, the combination of poor stack organization and sloppy housekeeping prevents realizing the potential of the new cranes since crane productivity is determined by the ability of the yard to clear or feed the hook.



We were also presented an overview of the proposed container terminal and its target market, Suezmax mother ships serving the Asia–Europe container trades. Our first impression is that these operations will cause serious vessel congestion in the harbor, particularly with respect to managing vessel traffic in a single-lane channel. In addition, the proposed basin width of 280 meters does not provide enough maneuvering room for tugs in the event of an emergency, thereby creating serious safety problems for vessel berthing. Finally, the allotted yard space does not appear to be sufficient for anything but a rapid throughput transshipment operation.

In summary, regardless of how well a port is managed, particularly a landlord port, it will have problems. Damietta faces a number of problems that should be addressed soon, including

- High berth occupancy and low vessel discharge/stowage rates.
- The use of two incompatible operating systems at the DCHC container terminal.
- General cargo handlings systems that need to be significantly improved.
- Poor condition of road and rail access into the port.
- Conflicting land uses that impede quay operations.

In addition, the port master plan needs to be updated to guide decisions about allocating space for new operations and facilities, and the impact of the proposed container terminal on operations should be carefully evaluated. Chapters 2 and 3 address port operation and other development issues; Chapter 4 addresses IT issues, and Chapter 5 addresses general policy.



## 2. Current Port Operations

### BERTH OCCUPANCY RATES

According to DPA officials, the port has an average berth occupancy rate of 80 percent. During our first tour of the facilities, all but three berths were occupied and at least ten vessels were waiting in the anchorage. Table 2-1 provides a two-month sample of occupancy by berth number. Berth occupancy rates of 70 percent or more (30-35 percent on a container berth) indicate rising congestion in the harbor and on the quays. Rates above 90-95 percent indicate serious congestion and operating problems that significantly affect the port's ability to achieve international standards of operating efficiency and services.

**Table 2-1**

*Berth Occupancy Rates*

Berth	Percent	Berth	Percent
Cont. Ter. (1-4)	60	13	143
05	119	14	125
06	94	15	106
07	110	16	134
08	94	In Anchorage/ Lighterage	29
09	106	Gas-1	24
10	77	Gas-2	7
11	112	Port average	56.9
12	138	Avg w/o private terminals	70.0

Except in the gas and specialty terminals, the berth occupancy rates are very high, averaging 109 percent. Nine of the 16 berths had rates above 100 percent, indicating frequent simultaneous berthing of multiple smaller vessels. Only berth 10 was below 80 percent. The exceptionally high 60 percent occupancy rate for the container terminals indicates serious problems with operations.

These high occupancy rates are more indicative of slow vessel discharge/stowage than of harbor capacity to handle the existing traffic. Table 2-2 provides a statistical breakdown of factors that affect vessel stays at berths, such as total TEUS discharged/loaded, handling rate per working hour, and handling rate per vessel call. Measures include time at berth, tons or TEUs discharged, calculated berth productivity per period worked, calculated berth productivity per vessel call, and berth productivity relative to vessel size.

**Table 2-2**

*Summary of Data on Container Operations and Other Operations*

Category	Hours	Metric	TEUs	Avg
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	Anchor	Worked	Per call	Tons	D/L	Tot./ Call	Per hr.	Hr/call	NRT <sup>a</sup>
<-100 TEUs/call	9.0	16.4	25.5	173.0	18.2	36.4	3.4	2.4	12,084
>-100 TEUs/call	8.7	16.2	24.9	1896.1	199.6	399.2	28.4	23.0	19,170
Total containers	8.8	16.2	25.1	994.6	104.7	209.4	15.3	12.3	15,442
Berths 1-2	5.8	13.9	19.7	1148.1	120.9	241.7	19.4	15.6	21,614
Berths 2-3	5.0	14.6	19.5	1245.86	131.1	262.3	20.4	17.2	23,488
Berths 3-4	12.4	18.4	30.9	776.6	81.8	163.5	10.1	7.7	8,167

Other Operations	Hours			Days/ call	Metric Tons			Avg NRT
	Anchor	Worked	Per call		Total	Per hr <sup>b</sup>	Hr/call	
General cargo	83.8	80.6	188.0	7.8	53.6	2.2	1.0	2,007
Refrig. cargo	46.9	68.0	115.0	4.8	1764.0	32.5	16.5	1,764
Bulk carriers	55.5	140.1	210.2	8.8	57300	409.0	272.6	10,928

<sup>a</sup> Net registered tonnage

<sup>b</sup> The exact, actual unit of measure is not clear from the data provided. Consequently, assumptions were made relative to the total amount transported versus the NRT of the vessel.

Table 2-2 is based on a two-month sample set of statistics provided by the IT department at Damietta. Those statistics covered time of arrival in the anchorage, berth number, time at berth, time when worked commenced, time when finished, total cargo handled, and basic vessel dimensional characteristics. Because of problems with the controlling RDT system, container vessel information includes only the totals expressed in kilograms that were discharged and not information on loaded containers. To estimate total TEUs handled per call, we converted kilograms to metric tons and then divided by 9.5mt, which is the worldwide average weight per TEU. Because container carriers strive to balance their outgoing containers (full exports plus empty containers) with incoming units, we multiplied this total by 2 to represent the total TEUs handled per call. A review of the raw number indicates that these estimates are fairly close to the mark.

## CONTAINER TERMINAL OPERATIONS

Addressing the container terminal berths there are a number of significant measures to be noted. These are as follows:

- The load/discharge rate for small container ships is 2.4 TEUs and for large containers 23 TEUs.
- Small vessels are handled primarily at berths 3-4, which are equipped with old Panamax cranes and serviced by a slow reach stacker operation. The relatively low average number of TEUs handled on these berths indicates that they service primarily feeder service operations.

- Productivity at berths 1,2, and part of 3 is very low, averaging between 19-20 TEUs per vessel working hour and 15 to 17 TEUs per call despite the availability of six modern post-Panamax cranes.
- Handling rates for berth 3-4, which seems to focus on smaller coastal vessels, is an extremely slow 7.7 TEUs per hour.

This poor performance is primarily the result of operational problems and poor yard organization. Solving problems with the RDT communication system will greatly improve planning and yard control in the short term. In addition, the yard needs to be reorganized to better facilitate tractor movement and yard-stack interface. Reorganization will entail cleaning up unusable equipment, parts, and trash; reconfiguring reefer service areas into RTG-serviceable stacks integrated with service platforms providing power; and monitoring equipment in the stack. The operators should also consider developing an off-terminal Inland Container Depot (ICD) as is being done in El-Dekheila with the development of a multi-agent container park for handling empty containers.

Terminal officials say they are giving priority to deepening the draft alongside the main berths to 17 meters to handle the mother ships. But this may be putting the cart before the horse. The terminal, particularly in yard operations, is not ready to handle large volumes of transshipment traffic or handle traffic at much higher speeds. Three things need to be done before the operators can even consider handling the large mother ships:

1. Reorganize the entire terminal into a high-density RTG operation to facilitate horizontal transshipment operations. This will require removing the reach stacker operation and achieving denser organization of traffic lanes.
2. Upgrade current operations to acceptable industry standards by rapidly completing the container terminal management system and giving staff time to become adept system users.
3. Move empty containers, Container Freight Station (CFS) operations, and all services not essential to container handling away from the terminal.

These upgrades can be implemented in parallel with berth deepening but must be fully implemented before operations begin.

## **GENERAL CARGO OPERATIONS**

General cargo operations also have problems. At Damietta, the average general cargo vessel is very small, is transporting an average of 54 MT of cargo per call, and is being discharged at an average of 2.2 tons per hour. When compared to similar operations elsewhere (60 -100 tons per hour for similar cargo), these rates are among the lowest we have seen—but among the easiest to improve if the operator is willing to make the necessary changes. Such changes are not prohibitively expensive. Productivity at Damietta can increase 400-600 percent with three changes: (1) improve basic rigging systems for moving cargo between vessel and shore; (2) unitize and palletize cargo as much as possible; and (3) adopt indirect delivery systems and increase use of forklifts with specialized attachments.

### Improve Rigging Systems

Rigging is the equipment used to attach the hook of the crane to the cargo to safely and efficiently transfer it between the ship and shore. Different types of cargo require different types of rigging systems. For example, Figure 2-1 shows a cable and hook rigging system inappropriate for handling bundled lumber; the cabling tends to cut into and break the bands that hold the bundles together, spilling lumber all over the place. A better rigging option is nylon straps, which are more flexible and will not cut into the wood or bandings. A variety of other systems can also be used, but they all work best when cargo is properly prepared (i.e., unitized or palletized).

**Figure 2-1**

*Inappropriate Rigging for Handling Bundled Lumber*



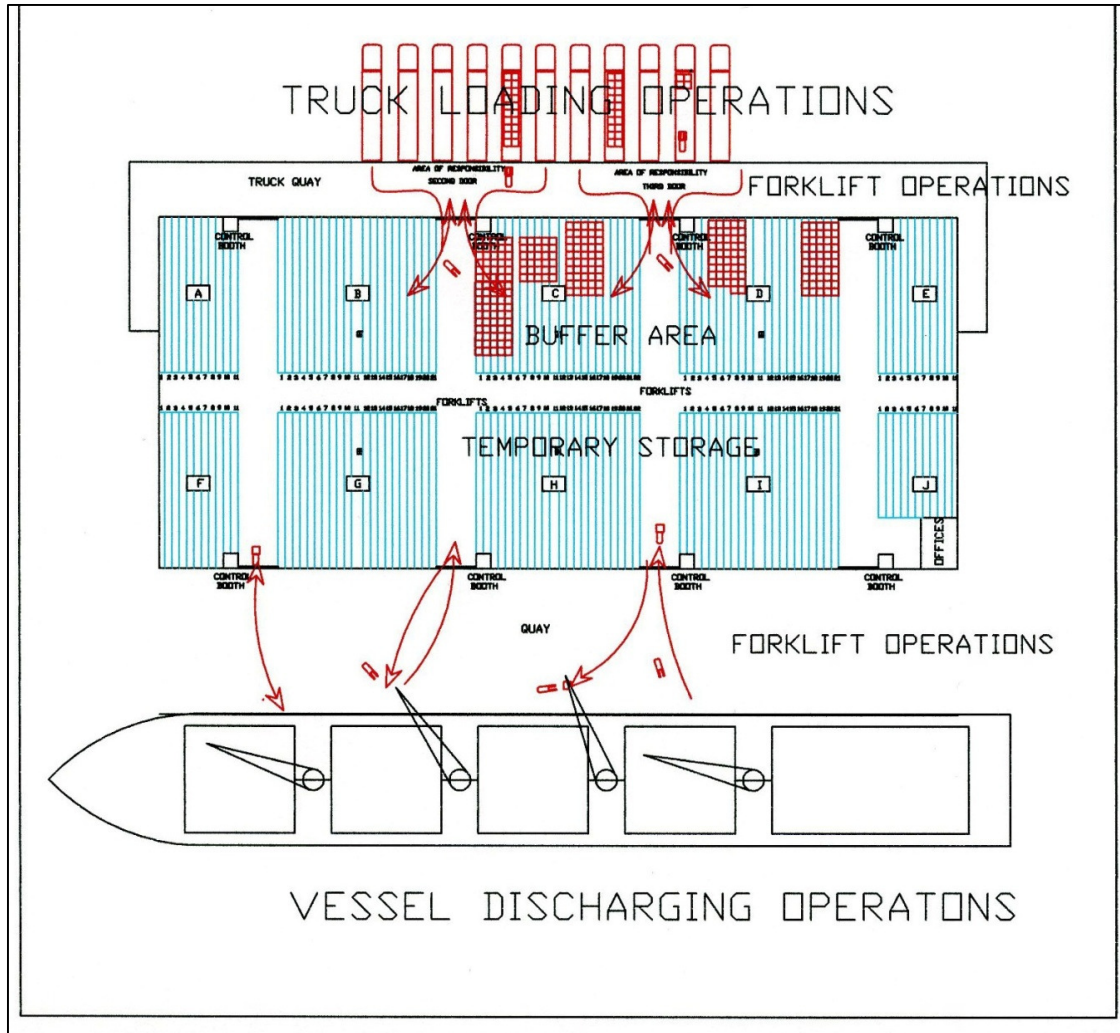
### Unitize and Palletize

Pallets are a standard way of unitizing cargo—especially pieces, small boxes, items in bags or small barrels, machinery parts, etc. Cargo can also be unitized with Marino slings, which are used to handle free loaded bags; with super totes (very large nylon bags with rigging straps on the corners); with shrink wrap for items such as bagged cement or fertilizer; or with pallets with pre-slung nylon straps that can be discharged quickly from a densely packed hold. Other cargo is inherently unitized but requires special rigging systems for handling (e.g., rolled steel or paper, boxed machines, steel girders, rebar). Finally, a variety of rigging systems allow higher rated cranes to discharge multiple units at one time. For example, T-lifts can lift up to 6 pallets of boxed fruit at a time and rigged spreader bars can discharge 6 to 10 super totes at a time

assuming the crane can handle the weight. The appendix presents a sound method for unitizing and handling lumber.

### **Adopt Indirect Delivery**

An indirect delivery system (Figure 2-2) is usually the most difficult option to grasp as it is counterintuitive to the traditional way of handling cargo in this part of the world. In this system, cargo is placed directly on the ground and moved quickly by forklift to buffer storage, such as a transit warehouse or open storage area. By clearing the hooks as quickly as possible, the system maximizes the cycling of the ships' cranes and discharges vessels as quickly as possible. Putting cargo directly on the ground eliminates the adjusting and controlling that must take place when putting it on a truck. If cargo is properly palletized or unitized the interchange between it and the forklift, once the hook is disengaged, takes only one or two seconds. The forklift should be able to move the cargo into a drop-off point in the buffer zone and return to the ship's hook in two minutes or less to meet the next cycle of the crane. Ports well practiced in this method, such as Philadelphia, can discharge properly palletized cargo at a rate of 300-400 tons per hour.

**Figure 2-2***Indirect Discharging Operation, Warehouse or Open Storage*

As cargo is discharged, a second crew inside the buffer zone receives it from the forklifts serving the vessel, organizing it into truckload lots and loading multiple trucks at the back of the buffer zone (see Figure 2-2). If the operator is handling a homogenous load bound for one consignee then the entire shipment can usually be passed through the system and shipped out in one day. For multiple consignees the process may take a little longer, but with the aid of a warehouse inventory control system it can also be done in the same time period.

**Advantages.** Indirect delivery offers multiple operational and economic advantages:

- An increase in the rate of discharge and throughput (at Damietta a factor increase of 400-600 percent).
- Continuous truck loading, whether a vessel is on the quay or not.
- A drastic reduction in the vessel berth occupancy rate.



- A lower per unit cost for handling cargo—50 percent or more reduction.
- A great reduction in damage to cargo.

**Requirements.** Using indirect delivery at Damietta will require

- A transit warehouse or open storage area behind the quay with room to queue trucks at the back of the buffer zone.
- Four to 8 forklifts, depending on vessel size and number of hatches to be serviced. The initial cost will pay for itself in considerable per unit cost savings as 4-5 times more cargo can be handled in the same time period.
- Cargo palletized or unitized in a manner that permits quick and efficient handling. This means that the operator must collaborate with the importer/consignee to ensure the cargo is prepared properly for transport.

**Cautions.** Other things must also be considered when adopting indirect handling. The operator must have an incentive to increase productivity, and for monopolies such incentives are of the carrot and stick variety. At a minimum, the port needs to impose basic productivity standards on the operator and provide a lease space (berth, warehouse/open storage, and truck access and loading area) that is sufficiently large and organized to allow efficient operations. The operator must purchase or lease appropriate rigging and cargo handling equipment and accept responsibility for damages to the cargo when it is in his care.

In Damietta, the most appropriate place for this type of general cargo operation is berths 5-8. The quay is fairly wide, and there are a number of large open storage areas, a large transit-type warehouse, and a refrigerated warehouse that should already be employing the proposed system. The biggest problem is that the railroad spur directly behind the warehouses will hinder truck operations unless brought to grade. More important, a group of agents' offices hinders access to the area. If the area is properly designed and laid out, however, space behind the warehouses is sufficient for truck loading that does not impinge on the agents' offices.

### **BULK CARGO SYSTEMS**

It appears that the port possesses sufficient specialized bulk handling systems—a large grain silo/berth operation employing large vacuators, numerous floor-loaded grain and other bulk warehouses, portable vacuators for discharging grain ships on open berths, a clinker handling system, etc. All systems appear to be in good condition and well utilized. Unfortunately, two months' worth of data is insufficient for assessing the systems' average productivity. According to available data, the typical bulk carrier spends three days in the anchorage and remained on berth six days for discharging or loading. Carriers were relatively small 11,000 NRT carrying an average of 57,000 MT and were discharged at a rate of 409 tons per hour. These vessel discharge and turnaround rates are about average for the systems employed. Serious problems cannot be detected without a more detailed assessment of the systems themselves or analysis of more comprehensive data operations.

## COMPARISON TO OTHER PORTS

We also toured the Ports of Alexandria and El-Dekheila to observe container terminals, general cargo and bulk cargo areas, and IT operations. (No detailed data on productivity or other operational aspects were gathered.) As at Damietta, both ports had excellent security, IT systems, and modern equipment and were well run.

### Alexandria

The Port of Alexandria is hemmed in by a dense urban environment, so development of new or more efficient facilities and operations is highly constrained. Recent road construction has greatly improved access to main facilities, but many facilities are old and were designed for a different period of operations. This problem is particularly true for general cargo and warehousing operations. As at Damietta, discharge is very slow, operators use inappropriate rigging systems, and a significant amount of cargo, particularly lumber, is being damaged.

Container operations are also constrained by location and lack of space. Access to and from the terminal is difficult. The terminal has only 3 quay cranes (2 Panamax and 1 post-Panamax) and 4 RTGS, which is insufficient for the traffic. Yard operations, which appeared to suffer from congestion, could be better organized. There is very little space for storing empty containers. Yard effectiveness in serving the cranes is difficult to assess without statistical data, but one can probably safely assume that the yard shares some of the same problems and causes as Damietta.

The bulk coal terminal next to the container terminal has seen better days. The equipment is very old, the rail access very poor, and the whole operation highly constrained by location. The terminal also has a variety of environmental problems.

In sum, the port's site and growth constraints have hampered development of operationally efficient facilities and services. Many of the upgrades suggested for Damietta apply to Alexandria. Space rationalization and a re-evaluation of land use would also be beneficial.

### El-Dekheila

The Port of El-Dekheila has significant land resources that are well planned and utilized. It has wisely focused on specialized markets, primarily bulk products such as coal, iron ore, grains, and fertilizers, and the bulk facilities are state of the art. The planning program seems proactive; for example, a container park to be used by multiple agents for empty container storage and recycling is being developed. Warehousing operations appear to be well organized but general cargo handling operations suffer from the same problems found at Damietta and Alexandria.

The container terminal also has many of the same problems as at the other ports. Yard congestion appears to be worsening. Many empty containers appear to be stored in the main yard and near the CFS (which accounts for the need for the off-terminal container park). More important, given the volume of traffic, the yard does not appear to have enough RTGs and yard tractors. The brochure that was provided indicates that the terminal has 5 post -Panamax and 6 RTGS. For normal operations, the rule of thumb is 2 RTGs per crane, but this terminal has just

over one per crane. Also given that it is a three-berth terminal it could benefit from an additional quay crane or two.

The port is in very good shape and has considerable room for expansion. The container terminal and general cargo area could benefit from investment in support equipment and better training and expert advice in modern cargo handling techniques.

### **SUMMARY AND CONCLUSIONS**

Overall, the port at Damietta has serious problems with berth congestion due primarily to very low berth productivity. A variety of factors contribute to this situation, as follows:

- **Container terminal.** Problems with the Container Terminal Management System's (CTMS) implementation, different handling systems in same yard, inefficient yard organization, and secondary services, empty containers, and junk cluttering the premises.
- **General cargo and some nonspecialized bulk cargo.** Inappropriate handling equipment, a preference for discharging to trucks, provision of secondary services (bagging) on quays, and lack of cargo palletization.
- **General operations.** Lack of exposure to modern cargo handling methods or new technologies that are standard in most developed ports.
- **Productivity incentives.** There appears to be insufficient economic and regulatory incentives to increase productivity.
- **Productivity standards.** Cargo handling and vessel service operations on most quays are contracted to private or semi-public operating companies, and port management tends to assume that low productivity is their problem, not the port's. The DPA makes little effort to spur operators to improve their productivity.

Given the rapidly rising demand for new port services and plans to develop new port industries and a Suezmax container terminal, the DPA must begin to improve berth occupancy rates and berth productivity. Chapter 3 presents the operational implications of the proposed terminal in detail.



### 3. Operational Implications of Proposed Terminal

Because neither the DPA nor the Ministry of Transportation was able to provide a copy of the operational and economic feasibility study developed for the proposed terminal, our analysis focuses on only three areas: (1) the effect of the design of the proposed ship basin and berthing plan on navigation and safety; (2) the availability of land for container yard operations; and (3) the impact of the project on vessel traffic in the harbor.

On the basis of conversations with various ministry and port officials, we do know a number of things about the proposed terminal. First, the target market is Suezmax container vessels as represented by the Emma Maersk, the largest container ship capable of transiting the Suez Canal (Figure 3-1). Its basic dimensions are:

- LOA 397M/1302'6"
- Beam 56m/183'8"
- Hull depth 30m/98'4"
- Draft 15.5m/50'10"
- Capacity 13,500-15,200 TEUs

**Figure 3-1**

*Suezmax Container Vessel*



Second, a ships basin approximately 1,083 meters long, 280 meters wide, and 17.5 meters deep is to be dredged. Third, berths are proposed for both sides of the basin, with capacity for three Suezmax vessels (five for vessels with LOAs of 300 meters or less). Fourth, the total project area is approximately 110 hectares or 264 acres. Finally, according to port officials, when fully operational this facility is expected to generate up to 3,000 new vessel calls per year within the next to years. We also know that the port is accessed via a one-way traffic channel and a turning basin with a diameter of 580 meters. Thus, the main issues to be addressed are:

- Is the proposed width of the basin wide enough for safe operation of a Suezmax vessel?
- Is there sufficient space on the proposed terminal to handle the container traffic to be generated?
- Can the port effectively handle a doubling of vessel traffic?

Fully addressing these issues requires substantial analysis and far more information and time than was available for our assessment. Our objective, then, is to define and analyze the dimensions of any problems and recommend options for solving them.

## BASIN AND YARD ISSUES

To maximize container yard area the developers have proposed a basin width of 280 meters, or 5 times the beam of the largest expected vessel (56 meters). This is a basic rule of thumb used by planners for calculating the separation between berths opposite of each other. This width allows two vessels of 56-meter beams to be stationed at opposite berths and then provides 56 meters on either side of an incoming or outgoing vessel also with a 56-meter beam. A vessel of this size vessel will have to be assisted by very large and powerful tugs that commonly range from 30-35 meters LOA. If the tug must push vertically on the vessel when it is on the basin centerline it will have only 21-26 meters between it and the vessel at berth behind it to maneuver. This is a very small space to control a vessel 400 meters long and 30 meters high.

These minimum dimensions are proposed to maximize yard space. Is the gain in yard space worth the risk of a catastrophic accident in the basin due to insufficient maneuvering room? Figure 3-2 is a conceptual layout of the proposed terminal and basin with capacity to handle three Emma Maersk size vessels. It shows the possible positioning of four 30-meter tugs moving a vessel to a back berth between two vessels already at berth. The assumption is that it is on course moving along the basin centerline. But is there sufficient room between the various vessels to compensate for

- Normal deviations in course due to wind, currents, and other environmental conditions?
- The “oops” factor, or unexpected events, such as loss of power by a tug, a breakdown in navigational equipment, or a missed calculation by the pilots or crew of the ship or tugs?

We were informed that the designers were completing desktop simulation models testing factors that could cause problems in the basin and how the crew, pilots, and tug operators could respond to them. The results of this study have not been received as of this writing. The problem with such models is that they do not incorporate or assess the oops factor very well. Given traffic congestion that this project will likely generate, it does not seem that there is sufficient maneuvering space to react quickly and appropriately to an unexpected event.

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### The Oops Factor

In New York City, a large tower crane erected on a building construction site was stabilized by a single cable that met minimum safety specifications for the situation. Safety inspectors had only recently approved the site. During operations the crane operator accidentally cut the cable and the crane toppled and collapsed a building, killing six people. The accident was apparently caused by unpredictable human error.

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**Figure 3-2**  
*Proposed Terminal and Berths with 280-Meter Basin*

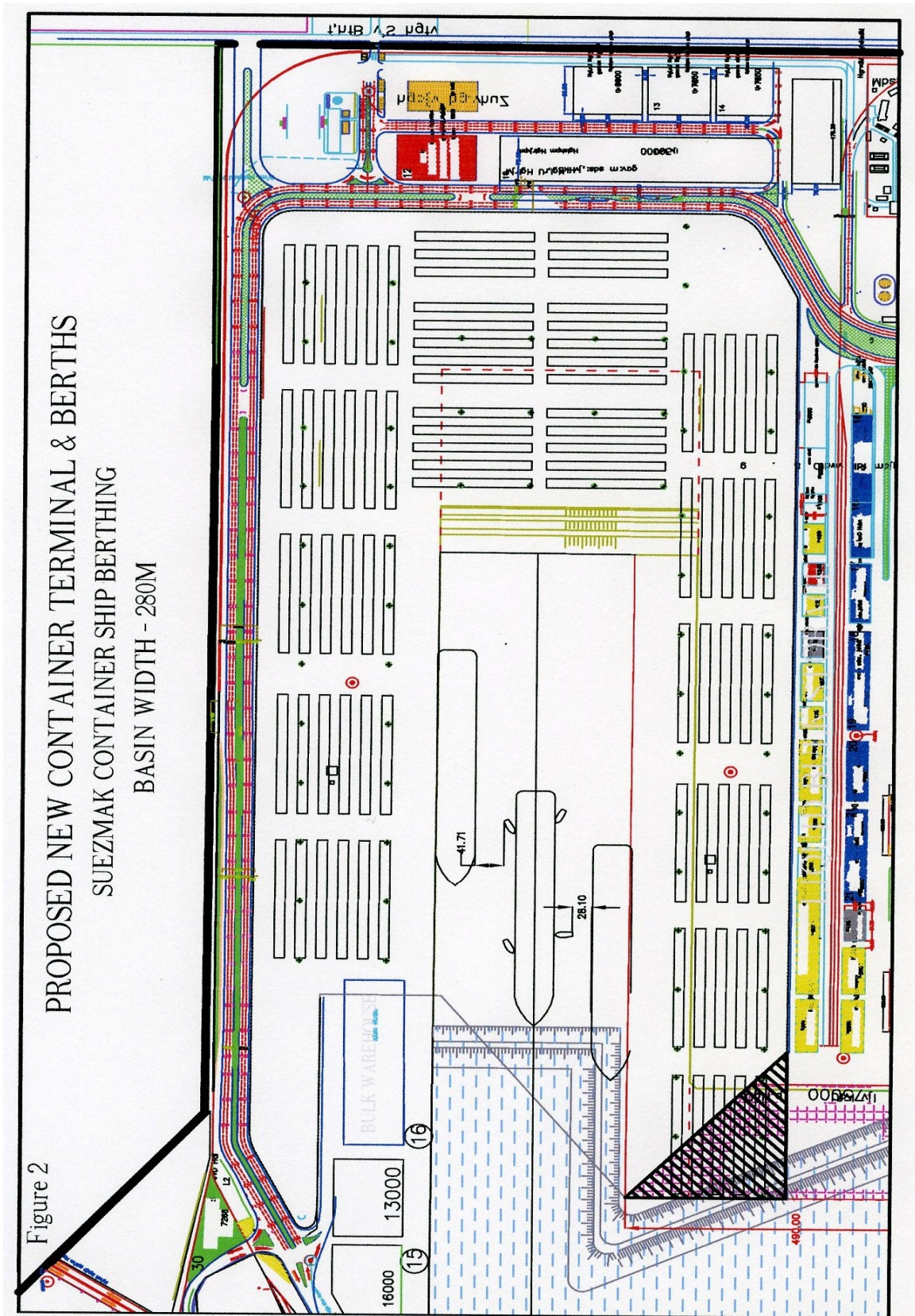


Figure 2

PROPOSED NEW CONTAINER TERMINAL & BERTHS  
SUEZMAK CONTAINER SHIP BERTHING  
BASIN WIDTH - 280M

BULK WAREHOUSE

13000  
16000

19

16

41.71

25.10

490,000

1175,000

What if another 40 meters were added to the basin width? How much more room would be available to cope with unexpected events in the basin and how much less space would be available for the yard? Figure 3-3 illustrates the trade-off between maneuvering space (risk) in the basin and available space in the yard. Available maneuvering space between vessels would increase to 76 meters on either side of the centerline of the incoming/outgoing vessel. Intuitively this appears to be a more comfortable distance and certainly reduces risk. Table 3-1 compares land resources available with a wider basin versus the original width basin.

**Table 3-1**

*Comparison of Land Resources with Basin Width at 280 versus 320 Meters*

Option	Land Lost	Land Remaining	Ha/b, 3 Berths	4 berths	5 berths
280m (as designed)	22.4 ha	88.0 ha	29.3 ha	22 ha	17.6 ha
320m (40 meters added)	27.0 ha	83.2 ha	27.7 ha	20.8 ha	16.6 ha
Difference	4.6 ha	4.8 ha	1.6 ha	1.2 ha	1.0 ha

In sum, the project gains a little more margin for error at the expense of 1-1.6 hectares per berth—not a bad trade-off in the larger view. The problem is that the land directly behind the southwest set of berths does not have enough backup yard directly behind it to effectively absorb a surge of 3,000 to 4,000 containers as might be expected in a transshipment operation involving Suezmax vessels. We suggest four options:

1. Move the small liquid bulk storage facilities to the proposed reclaimed area at the end of the bulk quay and use the vacated space.
2. Go to a more dense and automated operation using rail-mounted bridge cranes.
3. Handle smaller vessels on the southwest quay and the Suezmax vessels on the northeast side.
4. Expand the yard into the lands to the northeast and locate secondary services there (maintenance facilities, administration, utilities, equipment, and empty storage).

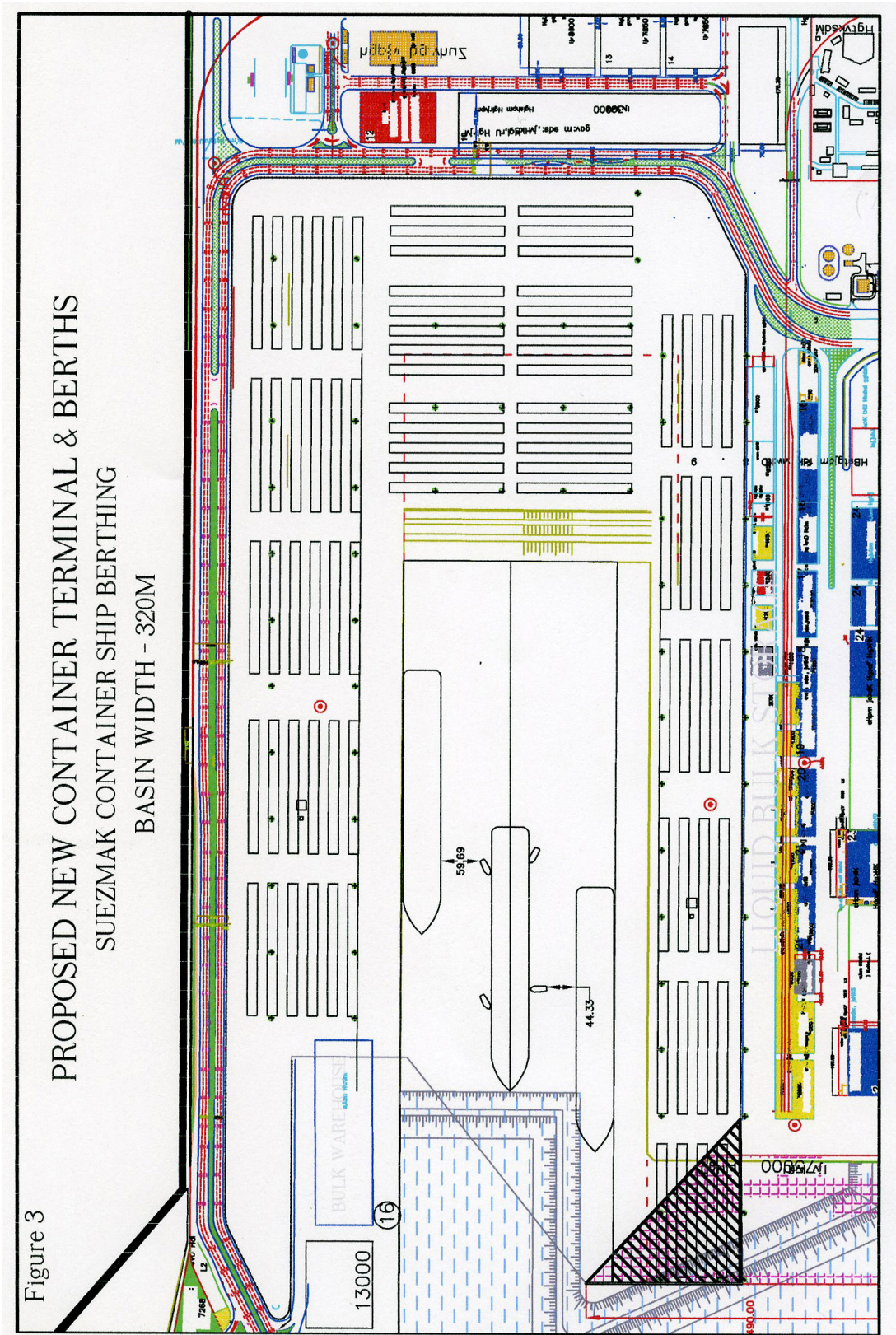
There are variety of ways to overcome the minimum loss of yard space while gaining safety and reducing the port's overall risks. It must be kept in mind that once built, it will not be economically possible to change it.

## **CHANNEL AND HARBOR CONGESTION ISSUES**

If up to 3000 more vessels per year will be in the harbor annually over the next ten years, as local officials project as a result of the new container terminal, then the port has a serious problem. That number of vessels is a doubling of the current vessel population. The port's current berth occupancy rate is 109 percent on common usage quays. A doubling of traffic amounts to 6,000 or more vessel calls per year, or an average of 17 per day. Sample data show an average stay in port by all vessels of 2.24 days. If berth productivity does not improve the port will have to provide berths for an average of 38 ships in the harbor per day.



**Figure 3-3**  
*Proposed Terminal and Berths with 320-Meter Basin*



So what are the options for dealing with this problem? First, the DPA must work with the berth operators to greatly increase berth productivity. In some cases, such as the general cargo berth, significant increases can be had at minimum expense. This need can be accommodated by bringing in operational experts on a regularly scheduled basis to assist operators in finding ways to increase berth productivity and efficiency. Other cases, such as the container and some bulk operations, will require in-depth operations planning, new technologies, and ultimately significant investment in new infrastructure, facilities, and equipment.

Efficiencies gained on berths will reduce demand for berth space but not for passage in the channel, particularly if the vessel sizes remain relatively the same. The current system for conveying can only be ratcheted so far before it reaches the limits of practicability. So what are the options? One is to gear the port's marketing to service larger vessels at berths with high productivity. This is a long-term strategy, however, and might not achieve the desired results. The second more practical option is to widen the access channel to accommodate two-way traffic or develop a second channel (given the constraints of the port this is not as likely).

## **SUMMARY AND CONCLUSIONS**

The proposed container terminal will generate significant business and employment for the port at Damietta and will have a major economic impact on the region. But with that success comes a complex set of problems that the port and government have not fully evaluated. We have highlighted some acute and likely problems—such as operational safety arising from the basin size and vessel congestion in the port. Others include land side traffic congestion and connections with the national transportation network, the best and most practicable use of land in and around the project area, and upgraded systems for the control of vessel traffic in the harbor, access channel, and anchorage.

## 4. IT Systems and Operations Control

The Damietta Port Authority (DPA) has had a modern IT system for two years. The port has sufficient funds to further develop and expand the system, but could benefit from technical assistance to ensure that the IT or automation strategy aligns with the port's business strategy (efficiency and profitability), that the port stays on track to achieve its strategies and goals, and that IT performance is monitored. Areas needing improvement include data use, vessel traffic services (VTS), and wireless implementation.

### IMPROVE DATA USE

The port has already invested in a modern IT system as a first step in modernizing operations and boosting efficiency. To capitalize on IT capabilities to improve port efficiency and to optimize returns on IT investment, the port should implement an executive information system, ensure IT governance, and develop a system for data verification.

#### Executive Information System

Senior executives use executive information systems (EIS) in making decisions that draw on internal and external data relevant to an organization's strategic goals. An EIS usually has simple menus, simple interfaces, and graphical displays; produces high-level reports that pull data from a database; and offer strong reporting and "drill-down" capabilities. They help executives highlight, analyze, and compare trends; monitor performance; and identify opportunities and problems. This capability is essential for port executives to monitor the port performance in real time. Important parameters to monitor include: traffic trends, turnaround time, berth utilization, daily revenues, revenue trends, equipment availability and utilization, and maintenance performance reports. For the Port of Damietta, the EIS would be developed as a software module to be added to existing applications at minimum cost.

#### IT Governance

IT governance means how an organization plans, directs, controls, and monitors current and future use of information technology. Every organization—large, small, public, or private—should ensure that its IT function supports larger strategies and objectives. The sophistication of governance varies with size, industry, and applicable regulations. In general, the larger and more regulated an organization, the more detailed its IT governance structure. According to the IT Governance Institute, governance of IT focuses on five areas:

- **Achieving strategic alignment** of IT functions with business functions through the planning process. True alignment occurs when the corporate side of the business communicates effectively with IT leaders about costs, reporting, and impacts.
- **Delivering on promised value** by doing what is necessary to deliver the benefits promised at the beginning of a project or investment. This may require developing a process by which

certain functions are broadened or increased when a value proposition is growing, and then narrowed or eliminated when value decreases.

- **Managing resources effectively**, such as by organizing staff by skills instead of line of business so they can be deployed to various lines of business on a demand basis.
- **Managing risk** in a formal framework that imposes rigor on what IT measures, what it accepts as risk, and how it reports on risks.
- **Measuring performance**, for example, by instituting an IT Balanced Scorecard, which examines where IT contributes to business goals, uses resources responsibly, and develops human resources. The scorecard system uses qualitative and quantitative measures.

IT governance implies a system in which all stakeholders, including the port executives, internal customers and related areas such as finance and operations, have the necessary input into the decision making process. This prevents a single stakeholder, typically IT, being blamed for poor decisions. It also prevents users from later complaining that the system does not behave or perform as expected.

### **Data Verification**

The Port of Damietta IT system is using adequate data verification techniques, based on checksum methods. However, an IT system is as good as the accuracy of the data that it provides. In addition to the traditional internal data verification and validation techniques, the full usage of the IT system is an excellent vehicle for verifying data and alerting users to data discrepancies. The IT system in the DPA is used only for limited applications, mostly financial. Even some of the financial applications—such as accounts receivables—are still not implemented. This limited use does not allow sufficient data verification by the port internal users.

## UPGRADE VESSEL TRAFFIC SERVICES

The currently installed VTS is a basic AIS/Radar system displaying on low-resolution displays. We recommend upgrading to high-resolution displays, new operation consoles, and higher definition redundant radars. Detailed specifications would be developed after a detailed site survey. These recommended upgrades will help the VTS keep pace with near doubling of traffic expected with the new container terminal.

## IMPROVE WIRELESS NETWORK

DPA elected to deploy a wireless network compliant with IEEE 802.11b standard, and specified a traditional 2.4 GHz frequency band. A 5.8 GHz band, however, provides better performance and less radio frequency (RF) interference. Egypt's National Telecommunications Regulatory Authority (NTRA), however, has not approved DPA to use the 5.8 GHz band and DPA is limited to the 2.4 GHz band. Initial implementation of the wireless network at the container terminal faced radio interference, poor availability, and poor performance due to use of conventional technology and limited high towers for access points. The DPA is planning to conduct a detailed survey and replace the conventional technology with the newer "mesh technology."

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### 2.4 GHz versus 5GHz

The entire 2.4GHz band is 80MHz wide, which allows only three non-overlapping channels. The 5GHz bands have much more spectrum available—12 non-overlapping channels, each with 20MHz of bandwidth. The 2.4GHz wireless LANs can experience interference from cordless phones, microwaves, and other wireless LANs. Interfering signals degrade the performance of an 802.11b wireless LAN by periodically blocking users and access points from accessing the shared air medium. If potential interference cannot be reduced to an acceptable level, the usual option is to deploy a 5GHz system, which is relatively free from interfering sources.

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## RF Site Survey Tips

We recommend a preliminary walkthrough of the area to detect the presence of potential RF interference and identify possible locations for mounting access points. With preliminary findings one can more readily plan to select access point locations, as follows:

- Perform the survey using tools (Exhibit 4-1) and talk to people in the facility to learn about other RF devices that might be in use.
- If possible and practical, prevent the interfering sources from operating. If interference sources cannot be simply turned off (e.g., one cannot require a nearby company to turn off its wireless LAN), it may be possible to disallow the use of Bluetooth-enabled devices where 802.11 users reside.
- Provide adequate wireless LAN coverage. One of the best remedies for 802.11 RF interference is to ensure the wireless LAN has strong signals throughout the areas where users will reside. If signals get too weak, then interfering signals will be more troublesome.
- Set configuration parameters properly. If deploying 802.11 networks, try tuning access points to channels that avoid the frequencies of interfering signals. For 802.11 frequency hopping systems, try different hopping patterns. The 802.11e MAC layer offers some built-in RF interference avoidance algorithms.
- Deploy the newer 802.11s wireless LANs. Most potential for RF interference is now in the 2.4 GHz band (i.e., 802.11b).

## Exhibit 4-1

*Simplify 802.11 Deployments with the Right Tools*

Wireless LAN installation is tricky. One cannot visualize the wireless medium. Facility construction and silent sources of RF interference affect the propagation of radio waves, often in odd ways. The right tools can ease the locating of access points.

**Basic Tools. Laptop with an 802.11 PC card and free site survey software from radio card vendor.** Most software displays access point signal strength and quality to determine effective operating range. One makes a "best guess" about locations, then places an access point at each location and walks around with the laptop while monitoring and noting signal levels. The goal is to verify the maximum distances that will maintain adequate signal levels, generally the value that continues to enable operation at the planned data rate (e.g., 11 Mbps). If the best guess location doesn't provide adequate coverage, one relocates the point or adds points and repeats testing. To ease the physical demand of toting a laptop, one can use an 802.11 CompactFlash card with a pocket PC device, such as the Compaq iPAQ, Casio Cassiopeia, or HP Jornada. This method, however, does not allow one to detect RF interference between access points and from other RF sources, such as Bluetooth devices, microwave ovens, and wireless phones. For one-time installations, especially in smaller facilities, free vendor-supplied software should be adequate.

**Advanced Tools.** An 802.11b spectrum analyzer graphically illustrates the amplitude of all signals falling within a chosen 22 MHz channel. This enables one to distinguish 802.11 signals from other RF sources that

may cause interference, making it possible to locate and eliminate the source of interference or use additional access points to resolve the problem. A spectrum analyzer also allows one to monitor channel usage and overlap.

802.11 limits up to three access points to operate in the same general area without interference and corresponding performance impacts, causing difficulties when planning the location and assignment of channels in large networks. Spectrum analysis displays these channels, enabling one to make better decisions on locating and assigning channels to access points.

Advanced site survey tools have been developed by a handful of test equipment companies, such as Berkeley Varitronics Systems (Metuchen, New Jersey) and Softbit (Oulu, Finland). Softbit's TriCycle, which can be loaded on a laptop equipped with a radio card, provides a very useful display of nearby access points, association status, signal levels, and can display coverage areas. It cuts the amount of time spent on surveys and helps ensure accurate surveys. Berkeley's handheld Grasshopper has fewer graphical features but weighs only three pounds.

Advanced tools are expensive—up to several thousand dollars—they are best used when installing multiple wireless LANs or when the wireless LAN environment is complex. Warehouses with many high metal racks and manufacturing plants full of machinery will wreak havoc on radio waves. In such environments, the extra cost of advanced tools is warranted.

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When conducting the site survey, follow these general steps:

- **Obtain, verify, and mark a facility diagram.** Before getting too far with site survey, locate building blueprints or prepare a floor plan that shows the location of walls, walkways, etc. Then walk through the facility to verify the accuracy of the diagram and to note barriers that could affect the propagation of RF signals (e.g., metal racks and partitions and other items usually not on blueprints). On the facility diagram, mark areas of fixed and mobile users. Mark where mobile users will not go as well as where they will go. Fewer access points may be needed if roaming areas are limited.
- **Determine preliminary access point locations.** Approximate the locations of access points to ensure adequate coverage on the basis of the location of wireless users and range estimates for the wireless LAN products. Plan for some propagation overlap among adjacent access points, but keep in mind that channel assignments for access points will need to be far enough apart to avoid inter-access point interference. Be certain to consider mounting locations, which could be high metal masts or metal supports above ceiling tiles. Note suitable locations for the access point, antenna, data cable, and power line. Consider different antenna types; for example, an access point mounted near an outside wall could be a good location if using a patch antenna with relatively high gain oriented within the facility (warehouse).
- **Verify access point locations.** Many wireless LAN vendors, including Cisco, Symbol, and Proxim, provide free RF site survey software that identifies the associated access point, data rate, signal strength, and signal quality. The software may be loaded onto a laptop or PocketPC to test the coverage of each point. Or one may use a handheld site survey tool available from several different companies. For example, Berkeley Varitronics Systems offers handheld devices, such as Grasshopper and Scorpion, that provide advanced site survey functions.
- **Install an access point at each preliminary location, and monitor survey software readings by walking varying distances from the access point.** The access point does not need to be connected to the distribution system because these tests simply “ping” the access point—but AC power is necessary so carry an extension cord and learn where AC outlets exist. Take note of data rates and signal readings at different points as you move to the outer bounds of the access point coverage. In a multi-floor facility, perform tests on the floor above and below the access point. Keep in mind that a poor signal quality probably indicates that RF interference is affecting the LAN. Verifying this requires a spectrum analyzer to characterize the interference, especially if there are no other indications of its source. Test results will determine whether an access point needs to be relocated and retested.
- **Document findings.** Once a location is found to provide adequate coverage, identify it on the facility diagrams to aid installation. Provide a log of signal readings and supported data rates near the outer propagation boundary of each access point as a basis for any future redesign.

### Mesh Wireless Networking

Mesh networking has been around for years; 802.11s is reserved for mesh networking standard. The IEEE expects to ratify a standard for 802.11s in 2008. Instead of a hub-and-spoke model of wireless communications—in which every device connects to a central access point, mesh networking has every device in the area act as a repeater or router, relaying traffic for everyone

else. When mesh-enabled devices are very close to each other they automatically create a wireless mesh network, and traffic hops from device to device until it reaches the nearest Internet access point, reducing the need for central antennas and improving wireless coverage.

Current mesh proposal is for interoperable standard for 802.11s that would be built on top of and be compatible with the current 802.11a/b/g standards and be designed so that nodes could automatically discover each other and form mesh networks, as well as for "Mesh Portals" that would be able to connect to regular 802.11 networks. The port also wants to build into the 802.11s protocol quality of service standards so that the network will know what traffic to prioritize if one were streaming video around a network.

## **SUMMARY**

The port has already taken big steps in IT implementation, but can benefit immediately from a technical assistance program to implement the recommendations offered in this chapter. Since most of these recommendations are applicable to all other Egyptian ports, the technical assistance program could be performed once to the benefit of ports that have already implemented or are planning to implement a port IT system. We strongly recommend that the Port of Damietta improve data use by implementing an EIS and IT governance processes and by developing a system for verifying data. We also recommend upgrading the vessel traffic system to cope with expected increases in traffic, and improving and expediting implementation of the wireless network for managing port operations.



## 5. Port Development

### EFFICIENT CARGO HANDLING

Inefficient cargo handling, with the exception of the bulk systems, is a major weakness at the Port of Damietta as well as ports in Alexandria and El-Dekheila. Inefficient handling is a major cause of the excessive berth occupancy rates that will hinder plans to expand the ports of Damietta and Alexandria. We were frequently advised at all ports that cargo-handling operations are not a concern of port authorities as those operations are in the hands of private operators. But given the myriad problems facing the DPA in developing the new container terminal it is clear that ***berth productivity is indeed DPA's problem***. For example,

- Low berth productivity leads to high berth occupancy, which leads to harbor congestion, which leads to high costs for vessel operators, which leads to higher rates for the operators' customers—who are also the port's customers.
- Under basic port economics, the more cargo that passes over the quay the more money the port earns. Wharfage fees are generally the single highest source of income for the port. By speeding up the throughput the port provides more opportunity for additional cargo to be handled and greater economic growth.
- All terminals and port support systems are interdependent. When one element is inefficient other elements are affected.
- If operators do not maintain industry standards then the port's traffic growth, marketing, and development will be hindered. High productivity in berth and terminals sells the port to new customers; low productivity drives customers away.

The Egyptian ports that were reviewed and the Ministry of Transport need to adopt a proactive policy and program to work with tenants and operations to improve productivity in their operations. This can be done a number of ways. For example,

- During initial contract negotiations and in renewal negotiations, the port and operator can agree to minimum equipment, technical, and productivity requirements based on international rather than local norms. Incentives for achieving target throughput and productivity levels significantly above the minimum might also be negotiated.
- The port can provide technical assistance and training in methods that raise productivity and reduce cargo damage.
- The port can encourage tenants to invest in new equipment and operating technologies by sharing investment costs. For example, the port agrees to invest in certain basic infrastructure and the tenant to supply building, equipment, and operational know-how.
- The port can foster competition among operators through such means as open stevedoring, allocation of certain berths/backup areas to competing entities with minimum performance requirements or privatization of semi-government operating companies.

These are only a few ways that a landlord port can act to raise berth productivity—and it is clearly in the port’s best interest to do so. The current hands-off attitude of port officials is counterproductive and allows port congestion problems to worsen.

### **MASTER PLANNING**

One of the best tools for guiding the effective development of ports is the port master plan. The lack of an updated plan is affecting Damietta’s long-term development. Without an updated plan the port does not have a foundation for making decisions or for accommodating requests from a variety of investors for spaces in the port. Land use and operational conflicts are brewing. For example, the allocation of a large parcel of land behind the container terminal effectively prevents an expansion of that terminal or the development of a much-needed empty container storage depot. It appears that the allocation of land just to the north of the new terminal to non-port use greatly constrains options for that facility. A number of other land use conflicts could also be addressed in a master plan.

The benefits of a current master plan are evident in the ports of Alexandria and El-Dekheila. The former recently greatly improved external accessibility and internal traffic flows by implementing a comprehensive transportation plan that was a component of its master plan. The latter has allocated space properly for a container park and is developing long-term plans for additional facilities. Officials also indicate that they are considering moving some bulk terminals, in particular the coal terminal, to El-Dekheila to create space for development more appropriate for Alexandria. This is a very rational way to plan the long-term development of a port.

#### Exhibit 5-1

##### *Features of a Good Master Plan*

- 
- |   |   |
|---|---|
| • Demand analysis and long-term cargo and fleet forecasts.  | • Identification of most appropriate development scenarios and targets.     |
| • Detailed infrastructure and land use assessment.  | • Creation of a framework for the short, medium, and long-term development. |
| • Detailed operations and technical assessment.   | • Overall financial and risk assessment.                                    |
| • Organizational, financial, and human resources assessments.   | • Environmental impact assessment.  |
| • Creation and evaluation (economic and operational) of alternative short, medium, and long-term development scenarios. |   |
-

## SUMMARY AND CONCLUSIONS

Overall, the ports at Damietta, Alexandria and El-Dekheila are generally well managed, well equipped, and have very good professional staffs. They also share a number of common problems, such as low productivity in the container and general cargo operations, vessel congestion in the harbor, and with the exception of El-Dekheila a relative lack of space to grow. For Damietta, there are a number of specific problems that should be dealt with soon to minimize their negative impact on major projects now being planned.

**Berth Productivity.** Berth productivity at Damietta is surprisingly low given the quality of capital equipment available. Productivity is impeded by technical problems with various operating and operations control systems, incompatible operating systems, lack of incentives for the operating companies to increase productivity, lack of training or experience in the use of modern technologies or cargo handling systems, and poor organization of some yards and quay support areas.

**Operational risks of proposed terminal.** The proposed container terminal raises serious concerns about safety, vessel congestion, and landside impacts. Results of desktop simulations of basin width and operating safety are being evaluated, but the extent to which the models incorporated the “oops” factor (human error, mechanical breakdown) is unknown. Our analysis indicated that another 40 meters in basin width could provide an adequate safety margin for emergency tug operations without significantly decreasing the total size of the container yard.

Although the extra width of the basin slightly decreases the size of the terminal overall, it more directly affects the amount of space available behind the southeast quay for handling Suezmax vessels. The port must be willing to consider a variety of options to facilitate the development of an efficient and effective operations system.

If the terminal realizes the additional 3,000 ship calls that government officials project, this means an average of 17 vessels per day will call the port and, if vessel dwell times do not improve, 38 vessels in the harbor per day. This in turn implies long delays in the anchorage and significant loss in revenue as ships go elsewhere or increase rates.

## PORT OPERATIONS RECOMMENDATIONS

Our recommendations are divided into 3 parts: 1) those that are specific to Damietta; 2) important studies to be undertaken; and 3) overall port development and general policy considerations. With respect to Damietta, the focus is primarily on the container and general cargo operations, IT systems, and planning issues pertaining to the proposed new container terminal.

### Container Operations

The terminal's operators have been planning to deepen the container berths to 17.5 meters to attract mother ships with the intent of being able to compete with the proposed new container terminal. Before this can happen, however, they need to greatly upgrade the efficiency and productivity of the present berths and yards. The first priority should be to complete the

installation of the NAVIS CTMS system and learn how to apply it to effectively organize the yard operation. The objective should be to upgrade the operation to be able to handle a minimum of 25 moves per crane-hour. For example, if 3 cranes are working simultaneously, the yard should be able to efficiently accommodate 75 container moves per hour. The second priority should be to convert the entire yard to a high density RTG system so as to accommodate the high call volume a mother ship will generate. This conversion would also include the integration of reefer stations into the RTG stacks at the back of the terminal to maximize the utilization of available space.

Additionally, the operators need to clear all obstacles to efficient operations such as junk, broken down machinery, container stripping operations, and all secondary services from the main operations area. They also need to establish maximum allowable dwell times for transshipment containers and install a fully secured perimeter and control system dedicated for container terminal security. Finally, moving long-term storage of empties off the terminal to a nearby ICD should be considered. The only empty containers that should remain on the terminal are those scheduled to be recycled out of the country within 48 hours.

### **General Cargo**

The general cargo operations are a problem in all three ports for very much the same reasons: poor unitization, lack of appropriate modern handling systems, and a reliance on direct discharge to trucks rather than indirect discharge systems to transit sheds or open storage areas. The key focus of the operator (and port) is to significantly upgrade the unitization and palletization of the primary types of general cargo being handled in the ports. This will require a partnership between the operator and the port to work with the importers/shippers to define more effective ways to package the cargo to facilitate handling both ship-shore operations and on the quay. Once properly unitized the next step is to identify the best systems for vessel loading and discharge. The final step will be to convert the operation to an indirect discharge system.

To facilitate this conversion, we strongly recommend that the port or ministry secure the services of an expert in general cargo handling systems to advise the different ports and operators on the various options that are available for upgrading the general cargo operations and possibly assisting the operators in procuring and implementing the new handling systems.

### **Port Information System**

The Port Authority of Damietta (PAD) has a modern IT system which has been operational for two years. PAD has sufficient funds to further develop and expand its IT systems. However, there are several areas of improvement where the port can benefit from technical assistance to ensure that the PAD aligns its IT strategy (automation) with the port's business objectives (efficiency and profitability), ensuring that the port stays on track to achieve its strategies and goals, and implementing ways to measure IT performance.

Areas for improvement include:

1. Better use of data by implementing several actions:

- a. Introducing an Executive Information System.
  - b. Implementing IT Governance.
  - c. Develop a system for data verification.
2. Vessel Traffic Services (VTS) are currently adequate. However, it is recommended that it be upgraded to accommodate expected traffic growth generated by the proposed new container terminal;
3. Improve the implementation process of the wireless network (to manage port operations), the deployment of which is behind schedule. The port specified a hardware and communication system for the RDTS that did not provide sufficient coverage and reliability. Now they have re-tendered the system using “performance specifications” to allow the system integrator to solve the problem.

### ***Better Use of Data***

The port is giving IT a high priority and has already invested in providing a modern IT system. This action is an important first step to modernize the port operation and efficiency, but the port needs to go further in order to capitalize on IT's abilities to improve port efficiency and to optimize the return on IT investment. Specifically, operations can be further improved if managers can make more informed decisions. So the port should implement an Executive Information System to enable managers to access real time reports.

Though notable progress has been made in the development of the existing system, the port can benefit from a technical assistance program to implement the recommendations addressed earlier in this report.

### ***The Proposed Container Terminal and Port Planning***

The proposed container terminal presents some serious problems with respect to vessel operations and its impacts on the overall operations of the port. The port needs to fully address the issue of safe vessel operations in the proposed basin and acceptable risk. Therefore, it is strongly recommended that the port conduct the following assessments and studies:

- Conduct full-scale bridge simulations testing the risks of a 280m versus 320m wide basin under different emergency scenarios. Simulations should involve pilots and tug captains from the port, and experienced captains of mother container ships expecting to use the facilities.
- Conduct a detailed assessment of the potential impact of the new terminal on overall port operation and development.
- Conduct a detailed vessel traffic study and evaluate options for a two-way or a second channel.

These studies can be carried out as independent studies or as part of a port master plan, the latter of which should be undertaken in the near future to better guide port expansion and mitigate against conflicting land uses.

With respect to enhancing Egyptian port system performance overall, we suggest the government:

- Investigate options for developing dry ports or cargo villages to house secondary port services and port-related manufacturing industries.
- Provide technical support services for port planning, operations, IT systems, and port development.

## 6. General Port Sector Policy Recommendations

This assessment has identified a number of areas for new policy considerations. Egypt needs to address the relationship between the ports and their tenants. It is strongly recommended that the Ministry/Port Authorities develop a pro-active program to assist tenants and operators increase berth and terminal productivity. This policy is critical for addressing the increasing vessel congestion in Egypt's harbors.

Urban encroachment hinders the port's ability to expand. While some countries are exploring physical relocation of terminals, others are seeking to maximize physical capacity by relocating ancillary activities outside the terminal. Experience elsewhere shows that container freight station services, warehousing, empty container storage, container repair, car parks and truck staging areas, hazmat storage, and value-added merchandizing, such as assembly, labeling, and packaging, have all been relocated outside the confines of port terminals. Egypt should make a concerted effort to identify such services in the ports and develop options for their relocation and assess the merits of private sector investment in the new sites (loosely referred to as Logistics Platforms).

As Egypt's port sector continues to transform to a landlord form of port administration, there will be opportunities to expand private sector participation. As this privatized environment evolves, however, an oligopolistic environment will emerge, indicating a risk of anticompetitive behavior. Private sector participation notwithstanding, port authorities in many cases will have monopoly pricing positions for several essential services. Considering both private and public sector dimensions, therefore, Egypt should establish an independent port regulator to ensure acceptable performance standards and to monitor pricing/service contract behavior among port operators. This regulatory reform effort, however, should be accompanied with a policy that encourages competition as a means for maintaining market discipline. This will enable Egypt to have a "light touch" regulatory approach, with a focus on monitoring competitive behavior as opposed to setting prices.

While Egypt has undertaken notable port sector reforms that, with the recommendations presented in this report, can induce substantially improved port performance, the country will still be challenged to attain acceptable performance from the transport logistics chain. We have learned from international experience, even in ports that have excellent reputations for efficiency (e.g. Rotterdam, Amsterdam, New York, Los Angeles), that port efficiency can be constrained by factors outside the port's gates. Improved performance inside the terminals can be negated by poor performance along the transport logistics chain. The paradigm for lowering transport

costs by focusing on port performance is no longer valid; today, freight corridors, of which ports form only a part, are now competing with other freight corridors. Inter-port competition has been replaced by inter-corridor competition, and time and cost have now been joined by reliability as factors affecting transport competitiveness. This suggests the need for Egypt to go beyond the port gates and promote a policy that encourages efficiency from port gates to hinterland points. It is in the ports' interest to improve logistics chain performance to grow their customer base. It is in the country's interest to improve logistics chain efficiency to enhance global competitiveness.

Though Egypt can pursue a number of policy options for improving port and transport sector performance, it must do so in an environment of ever-increasing security protocols. The US's Customs-Trade Partnership Against Terrorism program, the European Union's Authorized Economics Operator Program, and the impending introduction of similar guidelines from the ASEAN community ultimately mean that Egypt will be subjected to some form of security guidelines from the vast majority of its trading partners. While these guidelines are not mandates, failure to comply greatly increases the likelihood for more "robust" Customs inspections in trading partner countries, thereby increasing the risk of delay. From an economic perspective, we know from the recent literature that each day of delay for imports in the US incurs an extraordinary inventory cost equivalent to 0.8 percent of the value of the goods carried in the container. So Egypt's exporters will be challenged to secure their logistics chains to avoid the extraordinary cost associated with delay. Egypt's exporters have come up with their own ad hoc solutions for guideline conformance, losing economy of scale advantages that a more uniform approach would offer. Egypt should therefore develop its logistics systems to make it easier for all of its exporters to comply with the security guidelines without hindering freight movements. Today's IT technologies offer the potential to develop a solution while actually encouraging efficiency, with at least one firm offering a Secured Transport Logistics Chain solution presented in Egypt two years ago. The potential efficiency gains from security solutions offer the possibility to remove existing hinterland transport constraints and exact more efficient utilization of freight corridors and truck fleets.





# APPENDIX

## How to Handle Wood as General Cargo

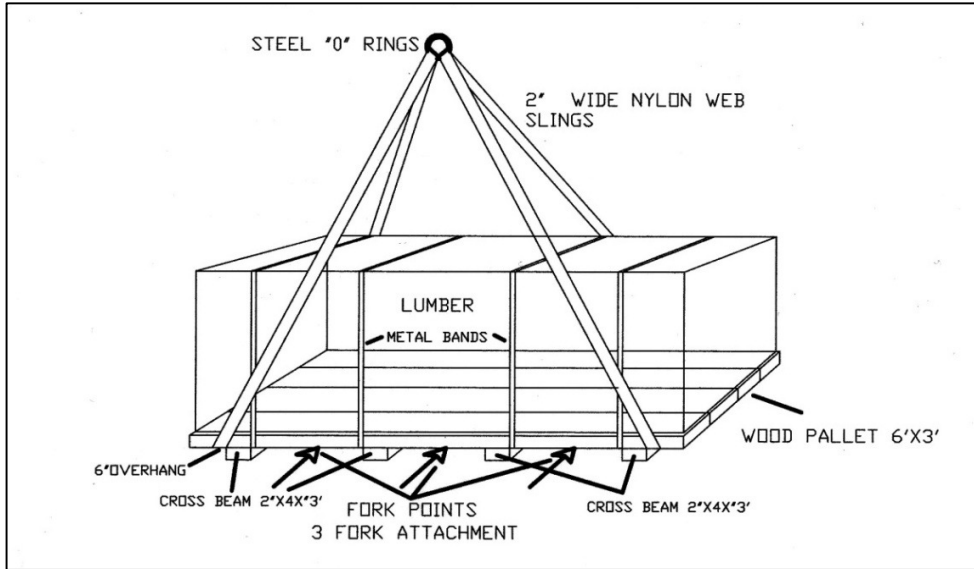
Bundled wood products are not being handled efficiently or safely at the ports of Damietta and Alexandria. Both ports are experiencing serious breakage of wood bundles and damage to cargo. Three problems cause such breakage and each has a solution.

The wood is poorly unitized. The exporter simply places the bundle on three cross pieces and then straps them to the bundle with .75" inch steel banding. The bundle then shears and shifts for lack of a solid foundation to hold it together. Figure A-1 shows how to use and handle wood of different sizes (using English units of measure). When wood cargo is discharged from the vessel it must be stacked on preconstructed pallets. The pallets provide a solid base that will resist the shearing forces caused by lifting. The pallets should be the same length as the wood. For wood more than 2 meters long the pallet should be at least 1 meter wide and constructed of 2-inch (5cm) thick planks screwed into at least four 2"x4" (5x10cm) cross beams, leaving an overhang of approximately 6 inches (15cm) beyond the outside cross beam. Screwing rather than nailing the planks into the cross beams makes them easier to disassemble and reuse, thus greatly reducing the cost of the pallet. For thinner wood, the exporter can use the same as in the bundle and screw two together to form the cross beams. ***Each plank forming the floor of the pallet must be screwed to each cross beam for the pallet to function properly.***

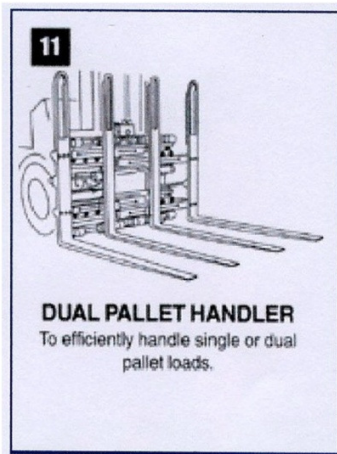
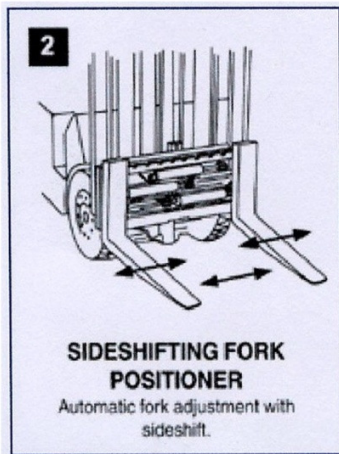
The steel cable and hook rigging system that stevedores use to discharge the cargo tends to break the bands holding the bundles together. Stevedores need to use 2-inch (5cm) wide nylon web slings attached to a steel "O"ring as shown in Figure A-1. These slings stretch and are soft; they do not cut into the bands, and are as strong as steel. They are formed in a loop and are simply draped around the overhand at the end of the pallet.

Forklifts with forks set only 2-3 feet apart are being used to handle the wood. This fork spacing allows the bundles, especially those more than 2 meters long, to sag on each end, again putting significant shearing pressure on the bands holding the bundle together. To move wood pallets on the ground, stevedores should use a 3-forked attachment that can be automatically widened to approximately 5 feet (1.5m). The attachment will prevent sagging at the ends of the bundle and help stabilize transport and lifting to trucks. Both of the attachments shown in Figure A-2 can be set up with three forks.

**Figure A-1**  
*Standard Pallet*



**Figure A-2**  
*Forklift Configurations*



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