THE DOCKS HANDLING ACCIDENTS
PROJECT

K I L I N D I N I H A R B O U R
PORT OF MOMBASA

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SUMMARY :

The "Dock Handling Accidents Study" sponsored by International Development Research Centre of Canada and effected by Kenya Factories Inspectorate, Ministry of Labour, was aimed at identifying major causes of accidents to personnel and damage to property and equipment used for handling cargo at the Kilindini Harbour, Port of Mombasa in Kenya. The data required for the study were collected from the three major organisations operating at the port, namely Kenya Ports Authority, (KPA), Kenya Cargo Handling Services (KCHS) and Kenya Railways Corporation (KRC). During the project period KPA merged with KCHS to form KPA. The data collected were computer processed and analysed with a view to identifying the major causes of accidents to personnel and damage to equipment and property in order to make appropriate recommendations to minimise accidents at the port.

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BACKGROUND INFORMATION:

The Port of Mombasa which includes Kilindini Harbour where the project activities were carried out is situated at Latitude 4°4'S and Longitude 39° 40'E. The entry channel to Kilindini harbour has a length of 7 nautical miles, width of 300 metres and maximum depth of 13.14 metres. It can accommodate classes of vessels along the quay with depths varying from 6.10 metres to 10.36 metres but with moored to bouys the depth reaches 29 metres. Oil terminals have depths of 9.75 metres to 13.41 metres. Vessels upto 250 metres long and 13 metres draft can therefore be accommondated at the harbour.

In 1985 report, there were a total of 16 deep water berths with 10 metres draft and total length of 3,044 metres out of which three container berths provide 596 metres length. Bulk oil jetties are situated at Shimanzi with 9.15 metres draft and at Kipevu with 13.4 metres draft. Cased oil jetty has a draft of 4.3 metres, lighterage facilities are two with length of 412 metres and comprise of North and South lighter wharves. There are two undeveloped berths designated No.6 and No.15 following serialisation of berths along the quay, storage facilities are provided by sheds and stacking grounds with transit sheds floor area of about 170,046 sq. metres and stacking grounds of about 114,117 sq. metres in floor area.. Passenger and baggage hall and shed provide floor area of about 1,222 sq metres other facilities include one customs warehouse with a total floor area of 4,000 sq metres and one cold storage covering an area of 1,247 sq metres with capacity of 4,562 cubic metres.

Various cargo handling equipment were indicated in 1985 report to number about 740 but a number of them were found to have been scrapped and others added during the execution of the project

activities so that in 1985 they were 640. The various equipment in operation included different types of cranes, tractors, trailers and forklifts.

The number of workers employed by KPA numbered in 1978 were 3,582 and in 1985 they were 4,505 while KCHS had about 9,161 in 1978 but started coming down to 7,404 in 1985. Workers from Kenya Railways Corporation directly stationed at the Port are engaged in cargo handling operation but direct only traffic movement of the railway engines and wagons. They have no major role to play in cargo handling operations at the port area.

There are sixteen shipping agents operating at Kilindini Harbour with a total shipping lines of 70 serving all continents of the world. Over 100 various registered ships visit Kilindini Port monthly on various occasions carrying import and export cargo. They totalled in 1983 1,282 and 1985 were 1,245. In 1985 exports totalled 1,878,000 deadweight tonnes both comprising of general cargo, bulk dry and bulk liquids, a drop in both figures compared with previous years. In the same year the number of containers handled comprised 103,362 mean twenty foot equivalent units (TEU) an increase over the previous years for export and imports. The Port handled 102,260 D.W.T. general cargo and 9024 TEU in containers. The monthly evolution of traffic which include annual transit traffic is shown in appendix I. Note that small variation in figures is due to rounding of the final figures. These figures were obtained from Annual Bulletins of Port statistics.

The operation of the port is governed by a statutory law which became operational in 1978 and revised in 1979. It established the Kenya Ports Authority to administer and manage the facilities and services at the ports of Mombasa, Funzi, Kilifi, Kiunga, Lamu, Malindi, Mtwapa, Shimoni and Vanga. Kilindini Harbour is within the port of Mombasa and is the only

one of major importance with well developed facilities and services. The rest are not yet developed but serve mainly for fish cargo and other smaller trade. Kenya Cargo Handling services as a subsidiary of Kenya Ports Authority was set up as an independent body to carry out all major cargo handling services within the port while an agreement was made with Kenya Railways Corporation to provide railway transport facilities as a major carrier of in-and-out-going cargo at the port. In 1986 Kenya Cargo Handling services was merged with Kenya Ports Authority to operate under one body namely Kenya Ports Authority. The functions of Kenya Ports Authority are spelled out in the Kenya Ports Authority Act, Chapter 391 of the Laws of Kenya with the necessary ammendments introduced after it was passed initially by Parliament in order to take into account the present development in the administration and management of the ports.

Rules made under the Factories Act, chapter 514 of the Laws of Kenya which relate to the safety of workers employed in dock work became operational in 1962 and are applicable to Mombasa port. The Docks Rules which are enforced by Factories Inspectorate prescribe measures aimed at ensuring the safety and health of dockworkers. Further requirements to supplement these safety measures are stipulated in ILO convention and recommendation of 1979 concerning occupational safety and Health in Dock Work which should now be taken into consideration since new development in dock work and associated operations make the Docks Rules of 1962 inadequate in catering for the safety of dockworkers effectively.

Project Activities:

Objective

The general objective of the study was to identify ways of

reducing injuries and ensuring safer working conditions in Kilindini harbour (Mombasa Port). This necessitated that project activities include the following which became specific objectives:-

- to obtain data on all accidents at the port for the last six years.
- to collect data on the layout, operations and equipment of the port.
- to collect data on operational methods, safety controls and maintenance operation and schedules for each type of mechanical appliance, together with the related number of accidents.
- to analyse the data and formulate recommendations and implement regulations to reduce injuries to dock workers.

Methodology of data collection:

Since the activities of the dock handling accidents project were to take about 30% of the overall work of the duties of the researchers and the programme had been scheduled to last two years, the actual activities were planned to be carried out every one week in a month from April, 1985. Largely this plan of visiting Mombasa Port for the purpose of the project was followed except in some few occasions when circumstances beyond the reseachers control prevented it. The activities of the project were carried out as follows:-

1. Occupational Accidents: - Data concerning occupational accidents resulting on injury to employees at the port upto and including 6 years; Preceding the study which

started in 1985 but the period extended to include the year when Kenya Ports Authority was established in 1978. The period 78-85 was covered. The data were entered on specific forms which had been designed but modified during this project activity to suit the recording procedures at the port for the three organisations, Kenya Ports Authority, Kenya Cargo Handling Services and Kenya Railways Corporation. The data collected, covered information on date of accident, persons injured, nature of injuries, equipment involved, material being handled, area of the port, time of injury, worker's age, experience and education. All workers at the port were male. Data collection was done through the examination of the records of the KPA, KCHS and KRC . Factories Inspectorate had no reliable and correct records. About four hundred eighty accidents throughout the period of study had been reported to the Factories Inspectorate without all the data required in the project. This figure was wrong and gross underestimation of actual figures available in the three organisations which was found to be 6,044 reportable injuries. The three organisations are required to report to Factories Inspectorate all reportable accidents where a person is injured and off duty for three or more days. This had not been the case and so the figures shown in the Factories Inspectorate records were wrong.

Before data collection was carried out at the beginning of the project discussions and briefings on the project activities and objectives were held with all persons concerned at the KPA, KCHS and KRC. The persons met were the personnel managers, principal engineers and operation managers of KCHS . and KPA . and District Officers of KRC in-charge of ports operations. This

enable the researchers to identify sources of records which were to provide data required and to obtain relevant reports about port operations. Familiarization visit to port area was done at this time. Other ports under KPA were also visited to see their functions.

The two enumerators were trained on how the forms were to be completed and the actual completion of some forms in the KPA, KCHS and KRC was carried out in the company of the principal researcher. It took a whole week to carry out this exercise.

The amount of work involved in collecting data on accidents to individual dockworkers had been underestimated when the project document was being drafted due to wrong figures available at the Factories Inspectorate which were used. KPA and KRC accident figures were relatively small compared with KCHS whose workers mainly provide cargo handling services and they, therefore, directly carry out handling cargo operations. The figures for KCHS was found to be over 5,750 accidents over the period under study. Data on accidents to individual workers for KPA and KRC were available in the files in one section of the respective organization, the personnel offices. But in the case of KCHS the data had to be collected in two different sections, in the safety and personnel offices. Although there were delays, the work of KPA and KRC was completed using the initial forms for the collection of data on accidents to individual workers. At KCHS, the personnel officer who was in-charge of directing the files containing personal data of those who had accidents was of the opinion that the files had also confidential information which should not be made accessible

to enumerators. He insisted that the information required by the enumerators must be extracted from the files of those accident victims by his members of staff. This approach to collection of data on accidents to individual workers necessitated the completion of one part of the forms by enumerators which concern "accident data" at safety department and the forms are then handed over to personnel staff members to complete the remaining part of the forms which concern "personal data". This approach never worked and the matter was discussed with the Personnel Officer in-charge of the exercise to allow the enumerators to extract the required information while maintaining the confidentiality of the rest of the information which may be in those files. When this matter could not be solved and yet the delays had already been caused, a new approach to collection of the data had to be devised and the initial form F.I. was made into two parts, one providing personal data and the other accident data. The records containing most of the information on accident data were photocopied and missing information inserted in from other records. These forms became F.1.2. The name and work number of the accident victim were extracted from F.1.2. and sent to personnel office to insert in the the missing personal data to the other part of the form F.1.1. Although this was an approach which accelereted the collection of data on accidents to individual workers, delays continued to be experienced on the part of the personnel office but the exercise was eventually completed. The format summary of these forms used for computer data processing is given in appendix 3 as FORMAT I.

2. Layout and operations:

Plans, maps and sketches of the port area were obtained from the KPA. The Survey of Kenya map was also available. These provided the information on the layout of the Kilindini harbour indicating the berths, sheds, yards, railway lines, roads and the entry channel. The structure of the KPA, KCHS, KRC and Ministry of Labour together showing organisational hierachy of each and the broad functions of their departments was drawn after interviewing responsible persons in these organisations on this issue. The information and organisational structures of KPA, KCHS, KRC and Ministry of Labour were entered on form F.2 and a summarized form provide comparison and their inter-relationship. This exercise was carried out when the then separate KPA and KCHS had not been merged into one organisation under KPA.

KPA provides facilities and services for smooth operation of the port while KCHS provides cargo handling services which ensure loading and unloading of cargo handling services at the port. KRC provide rail transport for cargo coming in or going out of the port, Ministry of Labour see to it that provision concerning the safety, health and welfare of the employees of these three organisations are observed in addition to condition of employment. F.2. is summarised into organisation Chart I in appendix 2.

The section heads in all the areas of the port were visited and interviewed on the operation of their sections, materials handled, equipment used, techniques applied, volume of cargo handled for export, import and transit together. The information was entered in form F.3. at site where

observation as to the validity of the information was made. During this exercise all berths, sheds and yards were visited. Apart from oil jetty berths, all other berths 1 to 14 and the lighterage wharves have sheds and yards attached to them. container terminal with berths 16 to 18 have a custom turnout shed and yards. No yards for berths 11 and 12 but only shed are provided. F.3. took the researchers five days continuous work. These forms were used to map out lay-out and operations.

The layout of the port area with berths, sheds and yards are shown in drawing map 1 appendix No.2, position of Mombasa is shown in map 2 appendix 2 and summary of organisation and functions of section of the four organisations KPA, KCHS, KRC and Ministry of Labour (MOL) is shown in Appendix NO.2 organisation chart I. Cargo handled is in appendix I. The berths and asociated sheds and yards are grouped to form sections as follows:-

Section A - berths 1 and 2

Section B - berths 3 and 4

Section C - berths 5 and 6

Section D - berths 7 and 8

Section E - berths 9 and 10

Section F - sheds BPI-3

Section G - lighter wharves, North and South

Section H - berths 13 and 14

Section J - berths 16 to 18 (container terminal)

Section K - berths 11 and 12

Other-workshops, - motor vehicles workshops at G Section, Central (Kapenguria) workshops and Kipevu (container terminal) workshops and other parts of the port.

Fixed equipment used for handling cargo composed of portal cranes are indicated in the layout map of the port area. Mobile mechanical cargo handling appliances are brought to sections depending on demand and type of cargo to be handled. The list of available mechanical cargo handling appliances as per annual bulletin of Port statistics of 1985 is as follows:-

From Annual Bulletin of Port statistics 1985

1. Portal Electric Travelling Cranes — as at 31/12/85

3 tonne cranes	1
5 tonne cranes	35
7 tonne cranes	6
10 tonne cranes	4
20/7 cranes	2
15 tonne cranes	5

2. Portal electric Fixed Cranes

2 tonne cranes	2
3 tonne cranes	6
5 tonne cranes	0
20 tonne cranes	0
10 tonne cranes	0

3. Electrical Overhead Travelling Cranes

2 tonne cranes	1
3 tonne cranes	1
10 tonne cranes	2
20 tonne cranes	0

4. Mobile Cranes

2/3 Tonne cranes	0
5 tonne cranes	8
6 tonne cranes	14
10 tonne cranes	2
11 tonne cranes	14
13 tonne crane	1
15 tonne cranes	0

	as at 31/12/83
25 tonne cranes	2
35 tonne cranes	1
40 tonne cranes	1

5. Floating Cranes

5 tonne cranes	0
60 tonne Jumbo cranes	1

6. Under Hung Jib Cranes

1 tone Cranes	6
1½ tonne cranes	8
wall Bracket Cranes	5

7. Container (gantry) Cranes

40 tonne ship to shore cranes	3
40 tonne rubber cranes	17
40 tonne rail yard cranes	4
40 tonne konw cranes	1

8. Overhead belt cranes

Overhead belt conveyors	2

9. Tractors

Tractors	80

10. Trailers

Trailers	250

11. Forklift Trucks

Forklift trucks	125

12. Side loader

25 tonne	1

13. Goose Necks

Goose necks	18

14. Goose Neck Stands

Goose neck stands	10
TOTAL	640

3. Categorisation of Mechanical Handling Operations:

From the annual bulletin of port statistics 1983, it was found that the total number of various mechanical handling appliance was 740 grouped into 12 categories. A representative samples of about one third of each category were selected and a total of 185 appliances were considered. The list of

equipment had been collected earlier from KPA and KCHS and it was later found that a number of mechanical handling appliances had been scrapped. Overhead travelling cranes were nowhere in the port area used for handling cargo and such type of cranes could not be studied and so one category of equipment was deleted.

The random selection of equipment proposed earlier in the project document was slightly modified to have preference on equipment which have had accidents and consider country of manufacture. Each category was lather randomly selected to provide a better representation of samples studied.

a. Operation methods and safety controls:-

The data on accidents to equipment had been obtained earlier from engineering departments of KPA and KCHS and the list of equipment with identification number and their location was made. The researchers started with KCHS equipment and it took two weeks to complete the study of 108 mechanical appliances composed of the following:-

- Tractors 20
- Tugmasters 29
- Forklift Trucks.....59

The data on reliability and precision in operation and fail safe on safety controls were entered in form F.5.1. Observation of operations and interviews of the operators were made by the researchers ~~&~~. The general condition of the equipment and other relevant observations were noted.

Other categories of equipment used by KCHS attached to prime movers were only checked for their general conditions and their safe use. These appliances, included the conveyor belts, trailers, goosenecks and gooseneck stands.

All equipment used by KCHS have no fixed location but are mobile and used throughout the port area wherever they are required.

Equipment operated by KPA workers compose of cranes only, and apart from mobile jib cranes which are used throughout the port area wherever they are required, the rest of the cranes are located along the quay and in the yards. Under hung jib cranes are only found in the sheds.

A total of 62 cranes were studied in six continuous days starting from lighterage berths through berths 1 to 18 and covering their sheds, and yards. The following types of cranes were studied in a similar way as in KCHS.

Portal electrict travelling cranes	33
Portal electric fixed cranes	5
Mobile jib cranes	14
Gantry container cranes	9
Jumbo floating crane	1

Apart from gantry container cranes which were all of 40 tonnes capacity, and Jumbo with 60 tonnes capacity, the other cranes were of varicus capacity as indicated in list of the type of equipment studied at the port. Their capacities ranged from one ton to 20 tons for cranes other than mobile cranes which reached 24 tons.

A list of all operators of equipment from KPA and KCHS had been obtained in the previous visits to the port. It was intended before the completion of forms F.5.1 to try and interview those operators on equipment which had had accidents when the operator was using that equipment. Most of the drivers during the early part of the exercise with KCHS resented. May be fearing some type of victimisation thereafter. Although records show that name of operator at the time when the accident to the equipment took place, many denied knowledge of such an accident and avoided to answer questions relating to the circumstance of occurance. When such a difficulty arose, it was decided to chose operators at random

depending on their availability on that shift for interview on other matters about the equipment and circumstances of the occurance of accidents to the equipment were extracted from records.

b. Maintenance:-

A visit was made to the engineering department of KPA and KCHS for examinations of records on maintenance and inspection schedules and their implementations. Available information was entered in form F.5.2. It was noted that some of the equipment studied had no maintenance and inspection records. A total of 157 were found to have some information on maintenance and inspection and dates they were carried out. The two organisations, and KCHS had different recording procedures and none had all the required data on maintenance and inspections. Documents supplied by manufacturers concerning maintenance and inspections were obtained from engineering departments of KPA and KCHS for some types of mechanical handling appliances. Some crane and forklift manuals for a few types of these appliances were studied and found to contain all that is required to draw up maintenance and inspection schedules and their implementation, but none of these were followed in the two organisations KPA and KCHS.

At KPA each crane has a file but some files were found without any information. There was a file containing maintenance schedules for most of the cranes

but inspection reports were found in individual equipment file if the inspection had been carried out and recorded. The available information was entered in Form F.5.2 for a total of 58 equipment.

At KCHS each equipment has a job card where all repairs and services are entered but a few equipment studied were found to have job cards. Information on the repairs carried out before and after the accident was entered in the form F.5.2. and the number of services carried out since the equipment was commissioned was noted. Major defects were also noted in respect of each equipment. A total of 99 forms were completed.

Out of a total of 185 F.5.1 only 157 F.5.2. were completed leaving out 28 equipment without information on maintenance and inspection. The completion of forms F.5.2. took one week.

The two forms F.5.1 and F.5.2 were combined to give full data on equipment. The information required were identification of equipment, type, year commissioned, organisation to which it belongs, accident first recorded with the details of circumstances of occurance, number of accidents in which it was involved, number of services, inspections and repairs. Types of controls and safety devices were also recorded. The operators were asked to indicate whether instruction manuals of the equipment were available and content explained or not. These forms provided a summarised format shown in appendix 3 - FORMAT 2 used for computer data processing.

Observations:

a. Attachements:-

The attachments used together with lifting appliance for cargo handling were checked. These were trailers, goosenecks, pallets, hooks, tackles, rings, chains wire ropes and slings, fibre slings, nylon and wire nets cargo trays, grabs, chutes skips and tubs. For the purpose of checking these attachments, the KCHS maintenance workshop and the field where they are used were visited for a period of two days. From interviews with persons in-charge at the workshop and in the field together with inspections of the attachments, conclusion was made in respect of the conditions of the various attachments. Excluding trailers, goosenecks and pallets, all the other attachments come under the supervision of the person in-charge of the workshop and his staff who carry out regular inspection and maintenance of the attachments in addition to manufacturing and assembling some of the items such as slings, ~~and~~ cargo nets and wire ropes. Visual inspections are carried out quarterly in addition to annual inspection which is carried out in December. During the inspection and random checking, defective attachments are withdrawn and scrapped if they cannot be repaired.

In the field, it was noted that out of 17 trailers seen at random ten had no pressure for brakes and 15 had no light indicators making them unsafe to

use. Four goosenecks ~~were~~ seen also at random were found to have no covers and so each had pool of water which facilitate the rate of their corrosion. Two of the four goosenecks had each one broken brackets used for lifting them and one had all brackets distorted. It was concluded that both the trailers and goosenecks do not receive regular maintenance and inspection if not none at all.

Many pallets in use were found with broken or missing timber and some were distorted making them unsafe for use. This observation indicate that the procedure of checking their condition and withdrawing them from use is not carried out inorder to ensure safe use of the items.

All the hooks seen in use for handling general cargo had no safety latches. It was claimed that when the hooks were new, they had safety latches but were removed by workers supposedly because they reduce the rate of work and so the amount of cargo handled. Without the use of safety latches the rings can easily slip off the hook causing the cargo to drop.

Overloading of slings and snooter ropes were noted. In one case snooter fibre rope which was supposed to carry twelve bags had 16 bags of maize an overload of about half a ton while the other had similar cargo with 19 bags. However, these ropes are manufactured with a big safety margin of about 7 and 8 but the span of life is reduced due to such constant overloading. The main cause of parting of the slings and snooter ropes is overloading rough usage and storage condition

which accelerate wear and tear resulting in early failure of these attachments.

Safety nets were found in use under the ladders to the ship and between ship and quay overwhich the cargo is passing during loading and unloading which is good practice.

Regular inspection and maintenance by the Gear and Equipment section of Technical Services Department is commendable but should be backed by section supervisors in order to ensure that attachments are safe for use all the time. They should not allow overloading and use of defective gear and equipment.

b. General views on safety at the port.

Interviews were organised at the end of the project activities with safety section at the port, taken to represent the Employer and the Dockworkers Union, taken to represent the workers. Both were required to express their views freely on the overall accidents situation at the port, their role in respect of this matter, what role they would like the other parties to play (the parties considered in the project were Government, Employer and Workers), and general remarks not considered in the above items but relevant in the overall improvement of safety at the port. The interview was not guided by further questions other than the above and the discussion could be skipped on any item considered not appropriate for comment .

(i) Views of the safety section at the port:-

It was stated by the department that although safety personnel at the port see the removal of all accident hazards and unsafe practices in dock work as impossible, most accidents could be avoided through concerted efforts both by management and employees. Reportable accidents are investigated and necessary action is taken to avoid similar re-occurance. The port management established safety section with the objective of minimising preventable accidents which at the time stood over 200 cases monthly. With the collaboration of safety personnel and employees the figure has dropped to less than 40 cases a month.

The role of the safety department was stated to be accident prevention and ensuring safety of workers by inspection organised in zones where the staff on duty can identifying prevailing hazards and give advise on how to rectify the anomalies. Those directly involved are six including the Senior Safety Officer who is in-charge of the section but with the merger of KPA and KCHS, it is the hope of the section that it will be enlarged to be able to serve the employees of the two organisations. Before the merger it was noted that of the two organisation the section was under and serves only employees of KCHS. The safety personnel in the section were said to have been giving lectures regularly to workers attending courses at Bandari College. They ensure that relevant protective clothing and gear are provided to workers when handling

different toxic chemicals.

In respect of the role the other parties have played the safety section noted that a port safety and health committee was set up in 1975 comprising of Factories Inspectorate, Ministry of Labour, the Dockworkers' Union and the port management which has successfully produced a safety rules booklet catering for various categories of staff in the port.

(ii) Views of the Dockworkers' Union:

The Secretary General of the Dockworkers' Union represented the workers at the port. After being informed about the dock handling accidents project in broad terms, it was his view that a questionnaire should have been prepared and given to the union for study and reply in writing. It was explained that the purpose of the interview was to seek his free comment on the items mentioned above from his point of view as a representative of the dockworkers without leading questions. The Secretary General accepted and gave the following comments:-

In view of the Union, there should be no reduction in gangs performing cargo handling services because this would mean overstraining and possibly increased risks of injury due to pressure of work. It is important that the supervisor checks the gangways, railxing of stairways and that safety net is in position

before the workers board the ship. There should be free movement on board for cargo handling, oily paths cleaned and obstructions removed. In general there should be observation of safety measures in all working areas in the ship.

The Secretary General noted that equipment used for handling cargo generally have outlived their span of life and are therefore unsafe to use. He observed that repairs have not been properly done, brakes and controls are not working properly, head cover guards not there in the majority of the equipment and that timber is used instead of proper seats. He stressed that the workers could have refused to use forklifts and other equipment which are unsafe but due to economic situation of the country allowed time for the employer to replace them. The Secretary General said the cranes and forklifts have no proper maintenance schedules and that forklifts are supposed to work for eight hours not twenty four hours as is the practice upto today which result in these machines working until they stop functioning. The workers continue to use them and since they are not safe for use or to be on the road it is unfortunate that the workers are to suffer for using them. A case was sighted where a forklift driver was fined KSh.600/= for driving unroadwothy forklift on public road contrary to Chapter 403 of the Laws of

Kenya. The workers have now been warned that if they cause an accident they are likely to be interdicted. But they are not at fault since the machines they use are not maintained but generally defective although they are required to use them all the same. A circular by the Union to all members requiring them to stop using faulty machine until they are checked and defects rectified has been distributed. All workers should be provided with protective gear.

In the past, the Secretary General observed, there used to be a safety committee in the port comprised of the Union representative, a cross section of personnel of the port management and Factories Inspectorate. This committee has not been holding their meetings recently. But the most important thing is once given authority, the committee should deal with the safety matters without reporting to the Managing Director unless it is absolutely necessary. In its present state, it does not serve fully its purpose.

The Secretary General noted that the management has not taken positive steps to ensure the safety of the workers by providing them with personal protective gear; such as safety shoes, gloves and helmets contrary to port safety rules.

The role of the Union is to always educate workers

as to their rights at place of work and the importance of reporting all faulty equipment to the management for rectification. They are required to take necessary safety precautions at their place of work. However, the Secretary General noted that there are "Flag of Convenience" ships which do not comply with rules concerning the inspection and maintenance of lifting equipment and they should be made to comply with the relevant rules through the co-operation of the employees and the management.

It is the role of the managment at the port to ensure safety of the employees by abiding by the safety rules and International Labour Organisation conventions and recommendations applicable to dockworkers' safety and health. The Union will follow closely that the ractified conventions by the Government are carried out by the management.

The Secretary General stressed that causes of accidents are mainly due to poor housekeeping, ensuring cleanliness of the port, poor lighting of work areas, outdated equipment and obstruction by cranes which have broken down. He wanted more visits by Factories Inspectorate, Ministry of Labour to ensure compliance with safety rules concerning the above matters.

In his general remarks, the Secretary General wanted to see that the safety committee meetings

are regularly held with full authority to the committee to effect their deliberations without unnecessary reference to the Managing Director. He pointed out that productivity council should also be formed to look throughout the port and see problems eminating from different sections in order to devise ways of eliminating them and improving safety of workers and safe use of equipment and gear for handling cargo based in the respective sections. He stressed the importance of consultation between the Union, management of the port and the Factories Inspectorate in ensuring safe working condition of the port through the observation of Dock Safety Rules and Codes.

NOTE:

Views expressed during the interview with safety section of KCHS now under KPA and Dockworkers' Union respresentatives are wholly theirs and not of the researchers. These views, however, were helpful in the overall compilation of the project report which should reflect some elements of tripartism of Government, Employer and Union

Data Analysis and Tabulation

Analysis of data obtained from KPA, KCHS and KRC concerning the accidents which resulted in injury to an individual worker and damage to equipment or property was aimed at finding causes of these accidents in order to devise and make appropriate recommendations to minimise them. Causes were grouped in seven categories for both types of accidents involving personnel and equipment in order to facilitate tabulation of the data. A few examples of accidents in each category help in understanding the pattern of these accidents and therefore possible solutions to alleviate the causes of such type of accidents.

Causes of accidents resulting in injuries to personnel

Monthly evolution of registered accidents to individual workers at the port is shown in appendix 3 in Table A. It will be noted that recorded number from the port shown on table A far exceed that from Factories Inspectorate shown in the table. The high number of fatal accidents in Factories Inspectorate is due to inclusion of accidents while on duty outside the port which may be traffic accidents and other unrelated to cargo handling operation at the port area. Table I show distribution of the accidents in number and percentages. The number of accidents analysed is less than total number of accidents ~~analysed is less than total numbe of accidents~~ because not all accidents had enough information to enable processing by computer. Table 2 and 3 show causes and parts injured in firgure and percentage.

The actual number of accidents to individuals entered for computer processing is 5629. The total number in all the tables concerning accidents to individual vary from the actual figure entered due to missing value. Table 6, 8, 9, 10 and 11 had the highest number of missing values and these are handled further on in the report text. Other tables had small number of missing values and were not found necessary to consider them any further since these figures could not be expected to distort significantly the interpretation of the data.

MINISTRY OF LABOUR FACTORY INSPECTORATE
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****

TABLE 1 ... ORGANISATION BY SECTION

	RAILWAYS	PORTS	CARGO HANDLING	TOTAL	MISSING VALUES
A	0	0	654	654	-
B	0	0	487	487	-
C	0	0	419	419	-
D	0	0	665	665	-
E	0	0	589	589	1
F	0	0	137	137	-
G	0	0	356	356	1
H	0	1	800	801	-
I	0	0	11	11	-
J	0	0	464	464	-
K	0	0	691	691	-
C.T.	0	0	24	24	-
OPERATIONS	0	26	3	29	-
ENGINEERING	0	88	0	88	-
OTHER	21	23	165	209	-
	21	138	5465	5624	-
MISSING VALUES	-	-	3	-	

GRAND TOTAL 5629

... ORGANISATION BY SECTION (%'S)

	RAILWAYS	PORTS	CARGO HANDLING
A	0	0	12
B	0	0	8.9
C	0	0	7.7
D	0	0	12.2
E	0	0	10.8
F	0	0	2.5
G	0	0	6.5
H	0	.7	14.6
I	0	0	.2
J	0	0	8.5
K	0	0	12.6
C.T.	0	0	.4
OPERATIONS	0	18.8	.1
ENGINEERING	0	63.8	0
OTHER	100	16.7	3
	100	100	100

MINISTRY OF LABOUR FACTORY INSPECTORATE
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TABLE 2 ... CAUSE OF ACCIDENT BY SECTION

	FO	FP	SO	HO	HC	CS	OC	TOTAL	MISSING VALUES
A	161	92	46	155	152	25	23	654	-
B	133	86	34	105	104	9	13	484	3
C	94	55	30	88	118	13	19	417	2
D	197	83	40	119	152	42	29	662	3
E	135	90	50	116	108	39	52	590	-
F	33	18	9	36	24	2	15	137	-
G	96	50	39	53	88	10	21	357	-
H	241	114	48	172	162	10	54	801	-
I	1	2	2	2	0	2	1	10	1
J	120	91	34	90	94	13	22	464	-
K	181	102	47	143	139	28	51	691	-
C.T.	3	3	3	8	2	2	3	24	-
OPERATIONS	2	10	1	10	0	2	4	29	-
ENGINEERING	28	12	1	32	2	4	9	88	-
OTHER	41	37	10	43	10	1	67	209	-
	1466	845	394	1172	1155	202	383	5617	-
MISSING VALUE	-	2	-	-	1	-	-	-	

GRAND TOTAL = 5629

... CAUSE OF ACCIDENT BY SECTION (%'S)

	FO	FP	SO	HO	HC	CS	OC
A	11	10.9	11.7	13.2	13.2	12.4	6
B	9.1	10.2	8.6	9	9	4.5	3.4
C	6.4	6.5	7.6	7.5	10.2	6.4	5
D	13.4	9.8	10.2	10.2	13.2	20.8	7.6
E	9.2	10.7	12.7	9.9	9.4	19.3	13.6
F	2.3	2.1	2.3	3.1	2.1	1	3.9
G	6.5	5.9	9.9	4.5	7.6	5	5.5
H	16.4	13.5	12.2	14.7	14	5	14.1
I	.1	.2	.5	.2	0	1	.3
J	8.2	10.8	8.6	7.7	8.1	6.4	5.7
K	12.3	12.1	11.9	12.2	12	13.9	13.3
C.T.	.2	.4	.8	.7	.2	1	.8
OPERATIONS	.1	1.2	.3	.9	0	1	1
ENGINEERING	1.9	1.4	.3	2.7	.2	2	2.3
OTHER	2.8	4.4	2.5	3.7	.9	.5	17.5
	100	100	100	100	100	100	100

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TABLE 3 ... PART INJURED BY CAUSE OF ACCIDENT

	HEAD	FEET	TRUNK	HANDS	EYES	TOTAL
FO	50	1025	118	263	8	1464
FP	52	410	231	150	2	845
SO	0	389	3	2	0	394
HO	136	455	93	459	28	1171
HC	2	148	174	828	4	1156
CS	10	37	22	50	83	202
OC	18	112	77	161	11	379
	268	2576	718	1913	136	5611

... PART INJURED BY CAUSE OF ACCIDENT (COL %'S)

	HEAD	FEET	TRUNK	HANDS	EYES
FO	18.7	39.8	16.4	13.7	5.9
FP	19.4	15.9	32.2	7.8	1.5
SO	0	15.1	.4	.1	0
HO	50.7	17.7	13	24	20.6
HC	.7	5.7	24.2	43.3	2.9
CS	3.7	1.4	3.1	2.6	61
OC	6.7	4.3	10.7	8.4	8.1
	100	100	100	100	100

... PART INJURED BY CAUSE OF ACCIDENT (ROW %'S)

	HEAD	FEET	TRUNK	HANDS	EYES	TOTAL
FO	3.4	70	8.1	18	.5	100
FP	6.2	48.5	27.3	17.8	.2	100
SO	0	98.7	.8	.5	0	100
HO	11.6	38.9	7.9	39.2	2.4	100
HC	.2	12.8	15.1	71.6	.3	100
CS	5	18.3	10.9	24.8	41.1	100
OC	4.7	29.6	20.3	42.5	2.9	100

The grouping of the causes resulted in the following major causes which give example of the type of accidents in each group:-

1. Struck by falling object (FO) such as:-
   - Strong wind caused a ladder nearby to fall but directly upon his head.
   - While discharging maize on board the ship, a stack of maize fell on him in hatch No.V.
   - The case all of a sudden fell from the wheel-barrow and thus hit the right foot toe causing injury.
   - While passing between shed 1 and 2 going to time office, he passed near the lorry which was loading bags of wheat flour, when the bags fell from the lorry to his head and injured him.
   - While discharging bags of fertilizer in hatch IV the victim was hit by a bag of fertilizer which came off the sling while the crane driver was hoisting and the bags were hovering over him.

These cases obtained from accident report records at the port show the dangers caused by objects which in one way or another fall on personnel. These causes show many aspects resulting in objects falling such as unsecured ladders when in use and removal to safe position when not in use. Others include poor stacking, slinging, unsafe or careless handling and being under hoisted loads.

It will be noted from table 2 that falling objects caused more accidents than any other group of the causes of accidents and the total is 1466 of analysed accidents. These accidents resulted in 1025 injuries to the feet, 263 to the hands, 118 to rest of the body and 50 to the head. 8 injuries

to the eyes were also caused by falling objects as shown in table 3. It will be observed that safetv shoes and helmets would have reduced the number of these accidents. These items are only useful if the falling object is not very heavy otherwise the personnel should not be under hoisted loads.

ii. Falling of persons (FP) such as:-

- fell on slippery oily ground and injured his forehead. There were no lights so could not see the place properly in darkness.
- fallen down when arranging block files on top of cabinet
- sprained ankle when he slipped into planks of pallets he was loading.
- whilst boarding the ship, the person slipped on the ship's ladder; injury his left leg.
- whilst going aboard ship, he slipped and fell on live electric wire which caused burns to his right shoulder.
- whilst handling bags of coffee in hatch III aboard ship, he slipped and fell from a makeshift platform of pallets injuring his right ankle.

These causes illustrate how persons can fall on slippery ground, ladder, tripping over spaces between planks of pallets or falling off the makeshift platforms. It indicates also that on falling further injuries due to other causes can result as in the case of electric burns mentioned above and even dropping into the sea and being drowned. Fatality may result in case the height of falling is far above the ground.

From table 2 falling of persons resulted in 845 with the

feet being the most affected part of the body as shown in table 3 with 410 cases followed by the trunk with 230 cases hands and head also received injuries as a result of persons faling. Slippery and tripping conditions on work area should be avoided by good housekeeping.

iii. Stepping on objects (SO) such as:-

- Stepped on a sharp nail whilst stripping container
- while tracing containers in the park he stepped into a hole and was cut on the left leg by a piece of metal in the hole.
- whilst supervising to clear cargo along the rail line No.II, the coild steel sharp edge laying on ground injured his left foot.

Stepping on objects is due to poor housekeeping or clearing of objects on the area of work to ensure that there are no laying obstacles and holes on the ground. These obstacles may also be the primary cause of persons falling.

Although the number of cases caused by stepping on object is relatively small, 394 cases out of 5617 total number of accidents, the number caused by this group could be further be reduced by use of safety shoes as the feet were most affected with 389 cases as shown in table 2 and 3. Good housekeeping is also important in this case. Other parts affected are trunk with 3 cases and hands with 2 cases. These other parts of the body were mainly as a result of falling after stepping on objects.

iv. Hitting or striking against objects (HO) such as:-

- hit his left hand with hammer.

- while he was trying to push a male hook to a female buffer by force using his left leg he hit the coupling and injured the same leg.
- after unslinging the load when the crane was lifting the snooter wire, the wire swung and hit his eye.
- he was hit on the back by mobile crane whilst stacking some cases in the yard.
- was hit by shed door on the right hand arm while closing the shed.
- hit his foot against a pallet injuring his toe.

All these cases show care on the part of the workers is essential. But there are cases when collisions occur due to lack of skills in control of lifting appliances and attachments such as slings and hooks which swing stricking workers at the same time.

The figures on talbe 2 and 3 indicate that this group of causes of accidents resulted in 1172 cases of injuries and most affected part of the body are hands and feet with 459 and 455 cases respectively. The heads received 136 injuries, trunk 93 and eyes 28. Care on the part of workers handling cargo is most important but safety shoes will reduce some of the injuries. Care and skill in cargo handling operation call for training of workers carrying out these duties.

v. Handling of cargo (HC) such as:-

- while slinging cargo load of bags using rope slings during the signalling of "heave-up" his thumb was caught in the rope sling.
- while working on berth I stacking coils, his fingers were cut by protruding sharp edge of the coil.
- while working in hatch V aboard ship discharging bags of maize a bamboo stick used as dunnage pierced his

left side hand.

- while slinging bundles of wire ropes in hatch IV aboard ship, he was slashed by a protruding piece of wire
- his right hand finger was cut with knife while splitting or bleeding bags of oil cake on board ship.

The causes of these category of accidents involve skill in handling cargo and the use of protective gear appropriate for the work being carried on such as hand-gloves for the protection of hands.

In table 2 and 3, the number of accidents caused by handling of cargo as a group is 1155 with the most affected part of the body being the hands with 828 cases. The trunk received 174 injuries and the feet 148. The head and eyes were also affected. Although care through training is needed, hand-gloves would have reduced most of these injuries which resulted in so many cases of hand accidents. Both causes of accident due to handling of cargo (HC) and hitting by objects (HO) were practically second to causes due to falling object (FO). Therefore use of safety shoes, hand-gloves and training for skills and care in handling cargo are in this ranking order most important in reducing accidents at the port. The feet received most number of injuries standing at 2576 cases while the hands had 1913 cases as shown in table 3.

vi. Corrosive or irritating substances (CS) such as:-

- injured by leaking corrosive chemicals on the fingers.
- burnt on the hand by leaking caustic soda liquid in hatch I aboard ship.
- whilst working at berth I near the crane which was discharging bags of fertilizer, particles of fertilizer

blown by wind entered into his left eye injuring it.

- while set to handle drums containing toluene which were stuffed into container, he inhaled the dangerous vapour which was coming from the already opened container.

These cases indicate the fact that handling of corrosive irritating substance require the use of protective clothing and other gears such as goggles and gloves for the protection of eyes and hands.

From table 2 and 3 the number of these cases is relatively small, 202 cases with the eyes being most affected part of the body having 83 injury cases followed with the hands with 50 cases. The feet received 37 injuries and the trunk 22 while the head had 10 injuries. Use of protective gear would have reduced the number of these cases.

vii. Other causes (OC) such as:

- while he was opening the cover of radiator to put cold water the cover was forced open by steam scalding him.
- sprained his back while lifting rice bags.
- while leaving the office his car was involved in a head-on collision with another car on the slope of the road near port dispensary. He sustained mouth injuries.
- he was knocked and slashed on leg by crane rubber mounted gantry as it was moving from one place to another.

- whilst climbing on a forklift machine he accidentally touched the exhaust pipe which caused burns to his left palm.

- whilst arresting a suspected thief the same hit his nose thereby inflicting injury.

- whilst waiting for a cup of tea in H-canteen, a waiter carrying cups of tea stumbled and one cup fell and scalded his face.

The causes in this category vary widely from backaches due to wrong lifting techniques, scalding due to various causes to violent thieves and canteen accidents when having a break. Safety requirements in these cases depend on predictable causes of accidents and so call for training and care in addition to other preventive measures such as insulating exhaust pipe or positioning them away from the reach of operators of machines.

The number of accidents due to this cause is very big as indicated in table 2 and 3 which show 383 cases with hands receiving 161, the feet 112, trunk 77, head 18 and eyes 11. The use of safety gears indicated in other categories of causes mentioned above will help in reducing avoidable injuries.

Fatalities : This was considered separately since fortunately the number of cases was not large to warrant complicated analysis and tabulation. There were six recorded cases of fatalities during the whole period under study. Two cases occurred in 1978 one when a bundle of steel railway sleepers being discharged swung with great force, hit the deceased around the pelvis and fatally injuring him; and the other fell off the edge of the hatch coaming while croping in darkness having been closed inside twin deck by mistake. One case was registered in 1979 caused by a bag which fell off suspended pallet stricking the victim on the head causing fatal injury while in hatch II aboard ship. In 1981 there were two cases when one of the victim was buried in bags of phosphate when the stack collapsed on him in the shed, while the other struck by a swinging sling of six plates against the shed wall during lowering of the load with a crane. In 1982 one person was killed when a wire rod slipped from a bundle and crushed fatally the head of the victim. A case which did not involve cargo handling operations but within the port was registered. The case occurred when an askari or a security person was hit with a pair of scissors thrown by gangsters who escaped in a canoe. The pair of scissors landed on his stomach fatally injurying him.

In general, the dockworkers were found to have education at the level of primary education mostly and a few at secondary level, trained in cargo handling equipment and related operations and had experience except few cases. Due to the rate of work ranging from average of 100.2 tons per gang shift in 1981, 88 tons in 1982, 96.2 tons in 1983

124 tons in 1984 to 144 tons in 1985 makes the rythm of work intensive and more mistakes resulting in injury to personnel.

More detail analysis and tabulation of accidents to personnel is given in appendix 4.

In these tables as the other tables 1 and 2 sections I was not considered as a separate section since this was not shown in the records at the port. Section J was said to be the same as container terminal (C.T.) "Operations and engineering" were taken as "other parts of the port.

In table 4 apart from "container terminal" and other parts of the port accidents were more or less the same in all other sections. Container terminal had most modern cargo handling equipment and the cargo is containerised and therefore a few personnel were required. These personnel were also observed to be of higher education and more qualified in cargo handling operations than in other sections of the port where personnel were less educated [and using old types of mechnical handling operations than in other sections of the port where personnel were less educated] and using old types of mechanical handling equipment. Section F with 137 cases has only sheds while Section C with 418 cases has only one berth. No explanation could be attributed to section B with 487 cases.

In table 5 which suppliment table 4, it will be noted that most of the accidents occurred at

the berths; total number being 3146. This is due to cargo being handled both on the shore and in the ship. Where there was an indication of an accident happening in the ship such a case was classified as "other" together with other parts of the port. The sheds also had high figure as cargo is handled twice in the sheds when putting it in and when removing it out 1306 cases were recorded for the sheds.

Further analysis of the data as shown in table 6 indicates that handling of general cargo resulted in 1808 cases. General cargo come in various forms requiring various cargo handling attachment such as pallets and slings and various handling machines such as cranes and forklifts. When these are not safe for use and or use without due care accidents are bound to happen. Handling of bulk dry cargo use mainly bags or drums and is more similar to general cargo. 1286 cases were recorded for this type of cargo. Bulk liquid is mainly pumped and manual handling is limited and so the cases of accidents were also low. Containerised cargo require few personnel used mainly in stripping cargo for custom inspection and so few accidents are recorded. The figures for these two types of cargo were 285 and 203 respectively. Miscelleneous materials handled at the port considered as "other" had high figure 1722 but it was not easy to attribute these to specific types of materials. Missing values shown in table 6 are attributed to causes but not various materials handled. The figures for "other causes" (OC) are quite high due to lack of specific categorisation. This is followed by "Falling Persons" which may result when not handling any material. Monthly evolution of accidents by section is shown on table, 7.

All the months had more or less the same number of accidents except December which had a slight drop. This table cannot show any major variation in number of accidents by month. December has two holidays but nothing more. In table 8 which is a follow-up of table 7, first week of the month had more accidents numbering 1213 followed by second to the last week of the month with 1029 cases. In between the number of accidents are almost similar. No specific reason is given for

this phenomenon but possibly due to social activities enjoyed after salaries are paid at the end of the month and if mid-month is also paid. Further analysis shown in table 9 that more accidents took place at the end of first shift and at the beginning of second shift. First shift starts from 07.00 to 15.00 hours and second starts from 15.00 to 23.00 hours. The figures at the end of first shift is 1592 cases while that of second shift is 15.31 cases. Although the records at the port did not indicate the third shift, accidents shows that such a shift may have existed, resulting in 1114 accidents towards the end of the shift. The reason for this is generally accepted as due to fatigue in the cases of those accidents which took place towards the end of the shift. Mombasa is generally very hot during the day, temperatures being around 30°C and starting work after lunch may influence mental tiredness. To meet the target of the tonnage of cargo handled by gang the rate work may be increased at the beginning or towards the end of shift. However, these have not been confirmed as no study towards this end was carried out. In both table 8 and 9, the missing values distributed over the sections is due to non-recording of day or hour of accident by the reporting person. Entry error is associated with missing values within a given period in the two tables. In table 10, it will be noted that those with experience between 20 and 24 years had more accidents numbering 1223 cases followed by those with 15 to 19 years of experience with 1070 cases. This may be due to over-confidence, old age and lack of skills in cargo handling operation as most of these were recruited quite sometime go.

Those with experience below four years had 963 followed by those between 5-9 years experience as a result of lack of experience and skills both of which are gained with time as shown by the group with 10-14 years experience when the figure dropped to 702. The percentage in the two categories are reverse .

Those within the experience 5 to 9 has higher percentage that those with less than four years due to a number leaving for higher grades or resigning.

Between 25 and 29 years of experience and over 30 years of experience with 424 and 65 cases respectively may be attributed to few personnel in these categories who are directly engaged in cargo handling operations. Better skills and training may have contributed to low figures for those with 10-14 years experience and those between 5 and 9 years experience. The respective figures are shown in the table. In table 11 the ages of victims are given indicating the places where they were injured. Those with ages between 40 and 45 and between 45 and 50 had more accidents with 1134 and 1155 cases respectively. The ages between 40 and 50 years appear to be most affected although these are people who should be having enough experience.

In table 12, 13 and 14 number of days lost by organisations sections and the categories of the days lost are given to show the type of losses in days which the port suffered through accidents to workers. These losses can be reduced if measures which appear in the recommendation are effectively implemented. The overall man-hours lost which include data not processed by computer available in records for 1978 to 1983 (figures for 1984 and 1985 not available) are 1,039,591 out of a total man-hours worked for same period of 68,200,028 man-hours. The frequency rates and severity rates calculated for KCHS, since data for this organisation were available, as shown on the following table of frequency rates declined since 1978 to 1985 from 97.7 to 42.5 respectively. This may be due to better skilled manpower and modernisation of the port.

Employment:-

Number of Employees of KPA and KCHS:-

Year	KPA		KCHS		Total
	Eng.& oper	TOTAL Personnel	Dockworkers (Average)	TOTAL Personnel	KPA + KCHS
1978	2741	3582	5890	9161	12743
1979	2766	3626	5771	8963	12589
1980	2888	3752	5564	8813	12565
1981	3038	3986	5330	8615	12601
1982	3525	4744	5162	8584	13328
1983	3261	4366	4539	7655	12021
1984	3388	4545	4192	7466	12011
1985	3246	4505	3987	7404	11909

Note:- Eng. & oper = Engineering and Operations Personnel: and together with dockworkers are directly associated with cargo handling operations in one way or another.

Frequncy and Severity Rates for KCHS only

Year	Total Nb of Acc.	Total MAN-HRS worked	Total Days lost due to Acc.	Freq.Rate	Severity Rate	Total Man-Hrs lost
1978	1207	12,323,096	8410	97.9	0.676(1.90)	810974
1979	899	10816644	6528	83.1	0.603(1.30)	50586
1980	922	12163198	6796	75.8	0.575(1.82)	49163
1981	850	12233931	7266	69.5	0.575(1.820	49163
1982	670	11170801	5874	60.0	0.400(1.20)	42780
1983	555	9492358	4452	58.5	0.394	27553
1984	537	9499710	5326	56.5	0.524	-*
1985	403	9489400	4332	42.5	0.414	-*
Total	6043	87189138	48984	Av.680	Av.0.518 (Av.1.013)	1039591

Formula used:- 1) Freq. Rate = $\frac{\text{Total Nr.of Acc. x 1,000,000}}{\text{Total man-hours worked.}}$

2) Severity Rate = $\frac{\text{Total Nr.of Days lost due to Acc}}{\text{Total man-hours worked}}$

Note:-

a. Severity rate in brackets include death cases (Days lost + 7,500 days for each case)
b. Total Freq. and Severity rates are averages.
c. Total man-hours lost figures for 1984 and 1985 were not available at the time of study and available figures are not used for any calculation here.
d. Calculation for KCHS selections and to include KPA and KRC was not possible due to lack of required data.

CAUSES OF ACCIDENTS (INCIDENTS) WHICH RESULT IN EQUIPMENT OR PROPERTY DAMAGE

Yearly reported accidents to equipment is shown on table B appendix 3. Table 15 show the types of equipment studies by organisation and table 16 causes.

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TABLE 15 ... ORGANISATION BY EQUIPMENT TYPE

	RAILWAYS	PORTS	CARGO HANDLING	TOTAL
CRANES .. CONTAINER	0	8	0	8
P.E. TRAVELLING	0	24	0	24
P.E. FIXED	0	3	0	3
E.O. TRAVELLING	0	0	0	0
MOBILE	0	16	0	16
FLOATING	0	1	0	1
UNDERHUNG JIB	0	6	0	6
O/H BELT CONVEYOR	0	0	0	0
TRACTOR	0	0	42	42
TRAILER	0	0	1	1
FORKLIFT TRUCK	0	0	56	56
	0	58	99	157

... ORGANISATION BY EQUIPMENT TYPE (%'S)

	RAILWAYS	PORTS	CARGO HANDLING
CRANES .. CONTAINER	0	13.8	0
P.E. TRAVELLING	0	41.4	0
P.E. FIXED	0	5.2	0
E.O. TRAVELLING	0	0	0
MOBILE	0	27.6	0
FLOATING	0	1.7	0
UNDERHUNG JIB	0	10.3	0
O/H BELT CONVEYOR	0	0	0
TRACTOR	0	0	42.4
TRAILER	0	0	1
FORKLIFT TRUCK	0	0	56.6
	0	100	100

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TABLE 16 ... CAUSE OF 1ST ACCIDENT BY EQUIPMENT TYPE

	S	T	H	C	F	D	M	TOTAL
CRANES .. CONTAINER	0	0	3	0	0	0	1	4
P.E. TRAVELLING	4	0	6	1	2	1	5	19
P.E. FIXED	0	0	0	1	0	0	0	1
E.O. TRAVELLING	0	0	0	0	0	0	0	0
MOBILE	0	0	4	0	0	1	1	6
FLOATING	1	0	0	0	0	0	0	1
UNDERHUNG JIB	1	0	0	0	0	0	0	1
O/H BELT CONVEYOR	0	0	0	0	0	0	0	0
TRACTOR	3	1	22	1	0	4	2	33
TRAILER	0	0	1	0	0	0	0	1
FORKLIFT TRUCK	12	0	17	8	2	6	5	50
	21	1	53	11	4	12	14	116

CAUSE OF 1ST ACCIDENT BY EQUIPMENT TYPE (%'S)

	S	T	H	C	F	D	M
CRANES .. CONTAINER	0	0	5.7	0	0	0	7.1
P.E. TRAVELLING	19	0	11.3	9.1	50	8.3	35.7
P.E. FIXED	0	0	0	9.1	0	0	0
E.O. TRAVELLING	0	0	0	0	0	0	0
MOBILE	0	0	7.5	0	0	8.3	7.1
FLOATING	4.8	0	0	0	0	0	0
UNDERHUNG JIB	4.8	0	0	0	0	0	0
O/H BELT CONVEYOR	0	0	0	0	0	0	0
TRACTOR	14.3	100	41.5	9.1	0	33.3	14.3
TRAILER	0	0	1.9	0	0	0	0
FORKLIFT TRUCK	57.1	0	32.1	72.7	50	50	35.7
	100	0	120	100	100	100	100

As in the case of accidents to personnel, causes were grouped into seven major categories as follows:-

(i) Slipping or dropping off-handling attachments (S) such as:-

- whilst driver was discharging paper bales from ship to shore, the belt slipped and bales fell down one on the verandah and the other into the sea. One sling belt was used instead of two
- while the driver of machine was stowing the pallet of tea, he passed over a piece of dunnage, the machine tilted, the pallet fell damaging one chest.
- while crane driver was off-loading reams of paper from lorry, the pallet fixed with plastic belt and when hoisted the belt came off from the crane's hooks causing pallet to fall and 7 reams out of 10 got damaged as this was unsafe handling.
- as cargo was being taken to crane hook for loading 10 bags coffee fell off the pallet due to uneven surface on berth on the same day for same reason 38 bags fell into the mud and stained.
- while stacking cable drums with forklift, two cable drums slipped from pallet and rolled into the sea.
- while the forklift was ascending the ramp, a pallet came off the forks and fell down.
- while the crane driver was hoisting two slings of bags of rice, some bags slipped off from one sling dropping on one private lorry cab damaging it.

- the crane was heaving a sling of bags of sugar when 6 bags slipped and fell into sea.

- While the driver was taking a sharp corner the container went off the trailer.

- While loading bales of sisal from berth to hatch, one sling of three bales slipped fell onto the save-all-net which got cut and so the bale fell into the sea and was damaged.

- Loading a new forklift truck to lorry using another fork-lift, the new forklift slipped and fell getting damaged.The loading was unauthorised.

The causes of all these cases given here as examples were the result of poor slinging, uneven floors, unskilled driving of forklift specially on ramps, speed of handling, wrong attachment or in-adequate strength of nets and unauthorised handling of loads. This calls for improved skills and strict observation of safe handling procedures by operators and supervisors.In table 16 the total number of equipment studied which had caused an accident or accidents is 116.Those accidents caused by slipping or dropping off-handling attachments numbered 21 which is second highest after hitting or stricking cases.

ii. Troppling, overturning or derailment (T) such as:-

- While ford tractor was pulling trailer loaded with crates, the trailer passed over a damaged cover of a hole making the trailer to overturn and caused the breakage of four crates.

- While driver was shunting trucks on line 8, the trucks overpowered the tractor which skidded and overturned from channel.

- While the railway truck was being shunted using ford tractor from berth 9 line one to yard 9/10

line 4, the truck left the line and derailed.

- While off-loading a heavy lift package with its weight on one side gross weight being 16,500 kgs and on the other being 10,800 kgs, the driver of the mobile crane failed to fix the centre of gravity and the crane toppled on one side.

The above cases give the causes of toppling, overturning and derailing as being due to instability of equipment while in operation as a result of shifting movement of forces outside the centre of gravity to such an extent as to cause this type of accidents. This makes it essential to emphasis on training and ensuring their competence in operating cargo handling equipment. Complicated or uneven loads need the assistance of supervisors. Although example given are many only one machine was studied giving only one case of toppling in table 16.

iii. Hitting or striking against (H) seen as:-

- Cranes 102 and 103 collided between shore and ship. Crane No.102 was loading bales and it was swung towards the hatch with cargo on the net. So during collision one bale of sisal slided off from the net and dropped into the sea.

- While both drivers of forklift and payloader were reversing they collided and the forklift got damaged.

- While driver was driving the forklift slipped and crashed through the door and damaged it with forks piercing through.

- The ramp was too high for the tugmaster to pass and the trailer stand caught one of the pieces of metal joining the ramp. Seeing this the ship personnel lowered the ramp and the piece metal broke and fell into the sea.

- While driving towards container terminal, a G.K. car came speeding and knocked the forks off the lift. The car was also damaged.
- While loading full container from the trailer to ship using Kone crane, the container swayed about and hit the back glass of tugmaster and broke it.

Facts arising from the cases indicate that causes in this category, which include collisions, are maily due to lack of care and co-ordination of operations and movements, passage ways including access to RORO should be made safe by checking and complying with traffic rules together with maintaining safe distance among the machines which are in operation.Many accidents were due to hitting against or striking cases which numbered 53 as shown in table 16.This appears to be a major cause of accidents to the equipment.

iv. - Careless handling attachments (C) such as:-

- One pallet of nine drums dropped and got lost in the sea. The pallet was already landed by winch on the quay side when all of a sudden the winchman started to hoist the stay wire and dragged the pallet towards the sea and dropped the pallet into the sea.

- while the driver was pushing one machine with the other forklift, the forks slipped and pierced the radiator.

- Whilst the crane was lifting bales with sister hooks, one bale which came under hatch coaming was held back by the hatch coaming and the hook which was holding it was cut as a result.

- While discharging container 5 tons in weight with a crane of 7 tons S.W.L., our foreman, serang and gang unlocked two container shoes lock, when they were going round the container to unlock the other two shoes, the crane driver lifted or hoisted the container without signal to hoist by our gangway man, thus causing the jib and the wire block or wheels to bent upwards and rendered the crane to stop working completely.

- Gantry crane driver moved the crane without instructions and damaged ships derrick, the jib was broken.

- While the driver was lifting up Boss forklift machine to take on board the ship, he hoisted the crane without being given any signal by the gang and before it was properly hooked and so damaged steering wheel and rod of the fork-lift.

- Whilst stripping containers near ten days shed, the forklift got stuck on the ground and the driver tried using another forklift to lift the one stuck on the ground but the later broke its rear part.

- The crane driver lowered the hooks with rope slings into the hatch and accidentally snatched

the forklift and hoisted the cranes with the knowledge of gangway man forcing the driver of forklift to jump out. The forklift overturned upside down.

- When sling of drums from hatch was landed one drum rolled by the side of truck into berth and into the sea.

- While the crane driver was lowering 20 feet spreader to discharge container, the force on a container 40 feet made two holes on the container as the wrong spreader was used.

These cases illustrate careless handling of loads, none cordination of work, use of wrong appliances and carrying out dangerous operation without proper supervision and authority to do so. It calls for more comprehensive safety measures to be instituted with strict observation of safety in handling cargo and using equipment. Although there are a number of examples sighted under this category of causes of accidents to equipment table 16 shows only 11 cases for equipment studied.

v. Failure of handling attachment (F) such as:-

- Whilst the driver was lifting a stone crusher machine which was weighing 48 tons from the Jumbo deck to shore, the wire rope snapped and the machine fell between the shore and Jumbo deck.

- While crane driver of crane was hoisting machine weighing 6450 Kgs. he slewed the crane and the hoisting wire broke loose and the load fell on top of stacked drums which were damaged together with the machine.

- The container got unslung on one side thus twisting the spreader and corners of spreader were damaged.

- While loading containers from trailor brought from J section the right tyres, unit of two tyres, loosened from axis and dropped into the sea.

- While lifting cargo pallet, lift chain of forklift gave way.

- The driver tried to lift one steel coil weighing 2.4 tons with both forks of forklift brought together but failed due to a previous welded section which cracked bringing the forks down.

- Whilst the winch was swinging a sling of bags maize germ meal, the preventor and main guy of the inner derrick broke, the derrick swang outwards letting the runners loose and landed in the sea with 19 bags lost and 17 soacked wet.

- While shifting containers when he was lowering at about ten yards (3.3. metres) away, the front loader unhooked two sides and the remainder ripped off the hooks causing front top quarter ripped off.

- While lifting a package one hook of sister hooks broke into 2 pieces and 3 hooks of the sister hooks were completely bent.

- When discharging bags of sugar, two slings hooked each of 25 bags, using the crane, one of the rope

slings parted as the crane was being slewed towards the quay from the ship and rendered 12 bags loose with 3 bags falling into the sea and 9 bags on deck.

- While loading 6 steel coils onto the bogie the chassis of the bogie collapsed possibly due to old age and rust.

These cases which depict various attachment of cargo handling equipment and their mode of failure provide guideline as to the causes which eventually result in accidents and dangerous incidents ending in damage to equipment and property. The causes are mainly due to lack of effective scheduled inspection, maintenance and misuse by overloading, bulling against edges so that they are weaked by wear, poor storage so that corrosion /ne is accelerated, using wrong attachment and wrong method of handling. From the above it will be noted that it is important to train operators in safe techniques of handling cargo and use of the equipment with attachment followed by strict observed schedules of inspections and maintenance or replaced.Safety devices must always be in use and operational conditions such as for spreader locks. Under this category of causes of accidents to equipment, table 16 shows 4 cases for equipment studied.

vi. Defective control mechanisms (D) such as:-

- While travelling from workshop to yard 16/17 off-load cargo from lorry, the steering of mobile crane was jammed and the crane driver lost control on the road and overturned.

- While lifting bundles of timber the brakes of crane become loose and the load came down and

rested on forklift which was reversed and left moving. The forklift stopped at the bank of the sea leaning on the ship.

- The crane over jibbed with a grab full of bulk maize and broke the roof of shed 8.

- The driver of forklift stopped the machine and applied handbrake but left it running and went to fetch water for engine cooling. While away the gear engaged and the machine moved backward and hit a motor vehicle which was parked opposite for off-loading bags of coffee damaging it.

- While the crane was off-loading the lowering brakes became inoperative and the load fell into the sea

- While driving forklift, the brakes failed and the forklift went into the sea and sunk but was recovered .

- The tugmaster's cabin was damaged and dis-positioned while moving through the ramp to the ship's lift as the brakes failed and it hit the lift.

- While the crane was under repair, the grab became uncontrolled and descended on the roof of shed damaging it.

These types of accidents are mainly caused due to failure of brakes and less with other controls but safe use of equipment require that all controls should be

reported for necessary remedial action to technically competent personnel authorised to take such an action without unnecessary delay. Operators of equipment should be forbidden from using equipment with defective safety devices and control. Table 16 indicates 12 cases under this category.

vii. Miscellaneous causes (M) such as:-

- two drums were found damaged in yard 16/17 and all contents leaked out. The cause was not known.
- For unknown reason one white unpacked peugeot 504 saloon went over the berth and fell into the sea between 15 and 16 cranes.
- While the driver of crane No.303 was closing the crane, the crane caught fire.
- While operating forklift, suddenly the machine caught fire.
- Whilst carrying cargo from full containers the forklift was reversed but sunk into a small ditch breaking transmission bell housing.
- When the case was lifted from yard stack to be placed on a lorry using crane, there was power failure as the case was being lowered. It then fell onto the lorry from a height of 3 feet approximately.
- Cableman shifted crane to hatch but left the cable lying on the railway line and was crushed out by wagon truck which was shunting causing power failure.

- While the driver was turning to right, the backside wheels of the forklift broke and went aside.

Causes of accidents falling under this category are varied and involve carelessness, defective equipment which are not electrically and mechanically ~~not~~ sound and failure to report when the equipment and property are damaged possibly due to irresponsibility. But as in all cases involving accidents to personnel and damage to equipment and property should be investigated so that the cause is identified and remedial measures taken to avoid similary cases in the future. Table 16 indicates 14 cases under this category

In general, equipment and attachments were found not to have inspection and maintenance schedules which are strictly observed. It was, however, noted that all the machinery studied were not operating but those which were in operation lacked alot of basic devices necessary for safe use of the equipment and attachments. Over sixty two had no light lamps or light indicators, twenty six had no horns or alarms, twenty one had no handbrakes, nineteen had no ventilation system in cabin except where possible natural which was found to be inadequate in such a hot humid climate. These were either absent or none operational. Other machinery had control levers without knobs, panel indicators and meters missing, forks' holding pins were missing and broken windows glasses in addition to essential control and safety devices. Repairs and replacement of defective parts was not done generally as a result of inspection and maintenance schedules carried out, except in some cases of attachments, but as a result of break-down. As such equipment and attachments could be

used when they are not gurranteed as safe for cargo handling. Steering system, brake system, tilt and hoist systems hydraulic and pneumatic systems and transmission system were noted as major repairs.

Detailed analysis and tabulation of accidents to equipment and property is given in appendix 4.

In appendix 4 the following observations can be made:

In table 17 which reflect the year when the equipment studied was commission, number of equipment commissioned before 1977 is 52 indicating that many of these mechanical handling machines are old. Tractors and Forklifts numbering 38 were among those studied which had been commissioned in 1981 and 1982. Few new machines were studied. Lack of other details reduced the number ... processed by computer to 131. Apart from container cranes which were fairly new, commissioned in 1983 and 1984 other machines were studied were commissioned at various years as indicated in the table. Only one portal electric travelling crane commissioned in 1986 was studied when the project was being carried out. Prior knowledge of the year when the equipment was commissioned was not taken into account since selection was random. The missing values were confirmed physically from records whose number was small to be due to lack of date of commissioning.
In table 18 equipment age at first accident by cause of accident shows that many of these machinery had an accident while still new and when old so that those with less than 2 years in service had a total of 49 cases and at ten years service had 15 cases. Most of these accidents were in the category of hitting or striking against category of causes with a total of 46 cases. Slipping of the attachments followed with 16 cases. Since the number of equipment studied can not be considered to represent the whole number of mechanical handling Equipment at the port, these figures only represent an indicator of the type of accidents and causes.

In table 19 total number of accidents for equipment studied is given to show that the type of equipment studied may have had more than one accident. No equipment from Kenya Railways Corporation was studied.

Tables 20 and 21 show places where these accidents occurred by cause and type of equipment. Most of these accidents happened at the berths with 47 cases and yards with 38 cases as these places are where most of handling operations using various types of machines are carried out. Fork-lifts caused most of the accidents with 50 cases followed by tractors with 33 cases and portal electric travelling cranes with 9 cases.

Hitting or striking against as a cause category had the highest number with 53 cases. Slipping or dropping off the attachments had 21 cases. Defective machine had 12 cases with careless handling following;claiming 11 cases.

When these accidents are further analysed on monthly basis, it is shown in table 22 that not much variation is noticed except for the month of May when the figure is small being 6 cases and in the month September with a high figure of 16 cases. The rest of the months show between 7 and 13 cases. The variation, however increase when it is further broken-down into days of the month shown in table 23. When the second week and last week of the month have higher figures than the rest of weeks. Second week has 25 cases and last week of the month has 29 cases. No clear reason can be given to this status of affairs. First week had the lowest of 10 cases while the rest of the weeks range between 16 and 18 cases. In table 24, developed from table 23, it is observed that most of these accidents happen towards the end of first shift between 10.00 and 15.00 hrs. and at the beginning of second shift between 15.00 and 20.00hrs each having 55 cases and 28 cases respectively. After 20.00 hours and before 05.00 hours the number of accidents to equipment is low, standing at 10 cases each. This may be

due to less activities at the port during these periods. Between 05.00 and 10.00 hours number of the cases is 13 possibly due to freshness of the personnel and preparations carried out before actual cargo handling operations gather momentum.

The type of maintenance these mechanical handling machines receive is given in table 25, 26 and 27. Services, inspections & repairs are based on year of commission of the types of each equipment so that since commission of the equipment until 1985 when the study project was launched represent maintenance period under study. Services represented preventive maintenances while inspections are carried out in order to find out the state of the equipment, rectifying measures where necessary. Repairs represent carrying out necessary rectifying measures after a breakdown. This is the final stage of maintenance if the equipment is still serviceable. In table 25 most of the equipment serviced represented forklifts with 263 such services followed by tractors having a total of 161 services. In case of cranes portal electric travelling cranes had 45 services between them. These figures may not represent the actual position as far as services are concerned since recording procedure for servicing an equipment was not clearly laid down. KPA had now cards for servicing equipment while KCHS had cards with all information concerning servicing and repairs. Inspections were not included in cards held by KCHS as shown in table 26 which indicate zero inspections for equipment under KCHS. In this table, portal electric travelling cranes had more inspections numbering a total of 73 while mobile cranes had 39. The equipment under KPA had inspection reports in each equipment file but some had no record although it was claimed that these cranes and equipment undergo regular

inspection. Repairs appear as they are not carried out for equipent under KPA, as shown in table 27 although it is an obvious fact that repairs are actually carried out. Therefore it is the recording which is not done as in the case of KCHS which indicate such repairs using each equipment card. Forklifts registered a total of 1806 repairs while tractors had 1128 repairs as shown in table 27.

Although these figures shown in tables 25, 26, and 27 cannot be factually reliable due to lack of proper recording procedure for services, inspections and repairs and also due to the fact that the number of each type of equipment studied vary, they still indicate the type of maintenance of equipment and types which fail more often and therefore the need for regular preventive maintenance which should result from regular inspection the interval of which is determinable through the rate of failure or break-down.

The safe use of equipment is determined by control and safety devices. In order to ensure that equipment is operated in accordance with the purpose for which it was designed and constructed, operational or instruction manuals for each types should readily be available to both maintenance and operators of the machines in the form which is easy to understand. The content of such manuals should be explained to the operators.

In table 28, controls considered were those associated with various types of motions, their acceleration and retardation as well as stopping them. In cases of cranes these motions involve lowering and hoisting or raising of loads, luffing of jib, slewing of upper structure and travelling of the whole crane if it is not fixed. For forklifts, the motions

involve lowering or hoisting, tilting forward or backward side movement of forks and travelling. Tractors are controlled like ordinary motor vehicles. Depending on the design of these machines various controls are used but the most important thing is whether the controls incorporated in the design are functional or not when the equipment is in use. The major controls found in various machines were levers, steering wheel (S/W), clutches, handles, joy-stick, brakes and others such as automatic changing of gears when machine is travelling. As can be noted in table 28, few had 100 percentage where the type of controls were supposed to be provided. Among the cranes, floating crane (Jumbo) had controls provided although the crane was found not in use at the time of the study. Brakes are most important for stopping all types of motions but as can be noted in the table some machines had less than 100%. Means of stopping was said to be reversing the motion which is a risky operation. In addition to floating crane , container cranes and underhung cranes were found to have properly functional brakes others had some brakes controlling some motions not functional or defective. Low percentages of other controls in the machines studied indicate defective or none functional of these controls but it also include the fact that the machines studied were of different designs and manufacturers. Therefore these percentages are only indicative but do not represent actual percentages.

Safety devices ensure safe use of equipment by limiting loads to be raised, speed of motions, and extend of reach such as overwinding or overlowering. The major safety devices considered during the study were overwinding switches(O/W/S), overlowering (O/L/S), traversing limit (T/L), long travel limit (L/T/L), load indicator (L/T), load radius indicator (L/R/I), automatic safe load indicator (ASLI) composed of

visual indicator (V/I) and sound indicator (S/I) overload preventor (O/L/P), automatic brake (A/B), level indicator (L/T) and others such as speed limits and control lowering by gravity in case of power failure. As in the case of controls the provision of various safety devices depends on the design and construction of various machines used in various cargo handling operations. Safety devices only assist operators of machines but do not prevent the use of these machines if they are deliberately excluded or short-circuted. This was the case with most safety devices found inoperative even though the types of the safety devices for various types of machines had initially been provided. The percentage shown in table 29 represent a more realistic situation for the various safety devices provided initially for the various types of equipment and variation in designs and manufacturers does not change the picture except slightly such as in cases of automatic brakes for tractors and fork-lifts where manual operation brakes can also be in use. It will be noted in the table that container cranes had all types of safety devices and in some cases such as over-winding and automatic brakes for motion motors had 100% As noted elsewhere in the report these cranes are modern and manufactured to high standard but some safety devices were found to be non functional or defective as indicated in lower percentage for these types of devices. Other types of machines indicate various percentages as a result of safety devices provided being none functional, defective or missing all-together. No information was given for apparent lack of safety devices for floating crane (Jumbo) as controls and safety devices could not be separated and so the table show zero percent for all safety devices.

It should be noted that for controls and safety devices shown in table 28 and 29 respectively Electric Overhead Travelling cranes (E.O. Travelling) and Overhead conveyor belt (O/H Belt Conveyor) were not studied and therefore the zero percentage shown. The information on these machines were covered elsewhere in the report as in the case with trailers.

As can be noted in table 29 most of the equipment had low percentage which indicate that the majority of the machines studied were being operated in unsafe manner.

In table 30 summary of percentage of controls and safety devices is presented for a clearer picture. As can be noted in this table the machines had high percentage of controls all having over 90%. This is expected since machines must have controls to be able to manipulate them. Where they are not provided the type of operation with control missing may not be carried out and the machine is limited to those operations with controls. In the case of safety devices when figures are rounded container cranes and portal electric fixed cranes had about 100% while other fell below 90%. Forklifts which operate like cranes have the least percentage of 26.8% and are therefore the most risky type of mechanical handling equipment used in the port. Mobile cranes follow in this list of risky machines with 75%. Tractors as said earlier are operated like ordinary motor vehicles and are not expected to have safety devices which were under study.

In table 31 percentage of utilisation of operation or instruction manuals is given. The operators were asked if they had these manuals, content explained and if the manuals were available. The container crane drivers appear to have better utilisation of these manuals and therefore high percentage of 75% but the rest of the drivers are not. As stated before the workers at the container terminal where the container cranes are in use are more educated than those working elsewhere in the port using various types of mechanical handling equipment. This situation should be rectified to allow more competent drivers throughout the port and the manuals more utilised in order that the equipment available can be used safely.

LOSSES

Losses incurred due to accidents to personnel and equipment and property damage as a result of hospital bills, wages, idle time, repairs and replacement of machinery as well as incidental expenses could not be obtained. However, compensation for victims who claimed could be found in records as well as premiums for insured property. Figures obtained, therefore reflected an under estimation.

Kenya Cargo Handling Services paid compensation totalling KSh.1,866,199.00 for claims of 338 individual cases between 1978 to 1985. Kenya Ports Authority paid KShs.1,061,661.00 for claims of 105 individual cases between 1981 and 1985 and present records show annual premium of about KSh.3.5. million only for comprehensive container cranes.

Available figures for claims paid out as a result of accidents to property for 1981, 1982, 1983 and 1985 other years excluded

are KSh.523,121.05 with outstanding disputable claims of KSh.2,276,827.90 as at the end of 1985. This figures do not include costs to damaged mechanical cargo handling appliances and equipment as a result of accidents.

It is expected that when a satisfactory recording system is used the above figures will be much higher, and to be able to introduce constantly improved safety measures and safety programmes such statistics are important when properly recorded.

Recommendations:

It is noted that Docks Rules 1962 made under the Factories Act, Cap 514 Laws of Kenya and Kenya Ports Authority Act 1979 (revised) in respect of safety matters at the port of Mombasa, Kilindini harbour are applicable and ILO convention and recommendation concerning safety and health of dock workers. These documents are available at KPA and Ministry of Labour and are relevant. From mentioned results of the Dock Handling Accidents study, recommendations made take into account human as well as technological aspects of work at the port, mainly in connection with safety in the use of cargo handling lifting appliances, aimed at reducing incidences of injury to dockworkers and equipment and property damage. The trend so far in terms of accident rates involving injury to personnel as well as damage to equipment and property has shown decline in cases of such accidents, from over 1200 in 1978 to just over 400 in 1985 for personal injuries, in all total injuries recorded was over 6000 cases. In the case of accidents causing damage to machinery and property the trend also indicates reduced cases of such accidents, from over 280 in 1978 to over 130 in 1985 for equipment and property damage totalling over 1800 cases.

The organisation hierarchy of all organisations involved, that is, Ministry of Labour (MOL) Kenya Ports Authority (KPA) Kenya Cargo Handling Services (KCHS) and Kenya Railways Corporation (KRC) was taken into consideration to identify responsibilities and authority as well as functions and inter-relationship of departments and sections of each organisation in respect of safety matters at the port.

1. Human aspects:-

i. Skill and care is required in operating and using cargo handling equipment and so training of operators and providing refresher courses should be organised regularly. Study shows those of longer services have more accidents (viz table 10). Facilities were found to exist in Bandari College which has safety lectures incorporated in the curriculum. The training in Bandari college needs to be supplimented in the field with supervisors trained on safety matters playing their full role.

ii. Observation of safe practices by workers handling cargo should be encouraged by good supervision. Bad practices should carry disciplinary action against both the workers and supervisors to ensure each party plays its role effectively.

iii. Rate of work should not be to the detriment of safe practices where cargo is not properly handled due to poor slinging, tying, hooking, overloading, use of wrong attachments and unsafe stacking or pallets. As shown by the sudy the three major causes are; Falling Objects (FO), followed by Hitting Objects (HO) and handling of cargo respectively (viz table 6). This calls for improvement in safe practice. Supervisors should lay down safe procedures of various types of work.

vi. Workers should use personal protective gear such as hand gloves, helmets, safety boots or shoes and overalls when handling cargo. Respiratory and eyes protectors should also be provided and used by workers where they are required to do so. These gears should be suitable so that they do not over-burden the workers under such hot and humid climate. Just as those who handle cargo, other persons in the vicinity should observe safety rules mainly connected with prohibition to be under raised cargo or on its path.

v. operators of equipment should not experience climatic conditions which will adversely affect their comfort and risks of injury when these conditions can be avoided by use of ventilators, overhead covers, enclosure of noisy machinery, short duration of work and breaks or taking other reasonable steps to reduce discomfort and accompanying negative effects. The safety section of KPA should be responsible for implementation and observation of the condition of work under various climatic conditions.

These recommendations are the responsibilities of KPA and KRC since KCHS has been absorbed by KPA, and KRC has some of its own personnel working at the port. The recommendations should be carried out as soon as they are approved by Ministry of Labour under the supervision of Chief Inspector of Factories.

2. Technological factors:-

vi. Machinery and attachments in use should only be those made and approved for the type of cargo to be handled. Competent technical personnel should be the ones to supply these appliances to supervisors of the sections who in turn hand them out to cargo handling crew.

vii. All machinery and attachment should come under strictly observed routine inspection and maintenance schedules. This should ensure safe use of the appliances. These schedules should follow manufacturer's instructions on inspection and maintenance. The study showed all previous KCHS equipment had no schedules or actual inspections records. The KPA equipment had schedules but no records of actual inspections although it was verbaly claimed to have been carried out. (table 25&26).

viii. All controls should be in good operational condition to avoid improvising them. It is the work of competent technical personnel to ensure uninterrupted supply of spare parts and repair of serviceable items.

ix. All safety devices as in the case of controls should be in good operational conditions at all times to ensure safe use of equipment. As shown in table 29 some essential safety devices were missing or non-operational.

x Operators of equipment should be instructed to report any defective control or safety device for immediate repair or replacement. Defective equipment and attachments should not be allowed for use as cargo handlig appliance or attachment in conditions which render the equipment or attachment unsafe such as overloading, worn out or unstable ground. Operators and supervisors who do not observe these safe practices should be disciplined to minimise risks of injury or property damage. But discipline should be meted out only if the higher authorities have fulfilled their parts.

xi. All areas including ship's holds. where cargo handling operations are being carried out should have stable grounds without obstructions and holes and slippery grounds rendered safe, safety nets under access routes into the ship and across cargo paths between ship and shore should be strong enough to fulfill their role and should be in position at all times.

These recommendations should be carried out as soon as they are approved by Ministry of Labour under the supervision of Chief Inspector of Factories.

3. Others:-

xii. Safety rules to be observed at the port should be improved to cater for new developments and should constantly be reviewed in order to cope with new situations at the port. The Docks Rules 1962 are overdue for revision and ILO convention and recommendation concerning safety

and health of dockworkers 1979 should be taken into consideration and used as guidelines in carrying out this revision for better safety standard at the port. This should be carried out by Ministry of Labour as soon as these recomendations are approved and accepted by the Ministry.

xii (a) The safety section and section supervisors to concentrate more on those periods of the month and hours where accident rated had been shown by this study to be high without relaxing safety supervision at the port in general. These are beginning of month and end of 1st and beginning of 2nd shifts as reflected in table 22 & 23.

xii (b) The type of cargo should be taken into consideration where accidents are more prevelent and the causes of accidents in order to effectively control accident rates at the port. In the study, the general cargo and dry bulk cargo caused the majority of the accidents as shown in table 6.

xiii. The safety section of KPA should be upgraded by the management and staffed accordingly to cope with the increase workload due to the merge of former KCHS with KPA. The section should have adequate authority to enforce safety rules at the port. The safety section has been instrumental in the reduction rate of accidents.

xi. Data on injury to individual workers and damage to equipment or property due to non-observation of safety rules and measures at the port should be properly and fully recorded to ensure that actual picture of the safety situation is available for use in promoting and improving safe conditions of work through safe practices. The data should include losses and costs of such accidents and incidents and an annual report made available for information and necessary action by higher authority in proportionate priorities. This should be done by

safety section of KPA and made available to Factories Inspectorate. Proper health and safety information system will be most appropriate for the data and information compilation.

xv. Funds required to improve and promote safety at the port should be adequately provided in the budget of KPA so that safety measures are carried out in proper manner taking into consideration limited availability of funds in general.

xvi. The work of safety and health committee should be rejuvinated and schedules of meetings regularly observed. The committee serves a very useful role in promoting safety at the port but their recommendations should be taken seriously by safety section of KPA in conjuction with Factories Inspectorate, Ministry of labour to carry the weight those recommendations deserve, as rightly observed by the general secretary of the Dockworkers Union.

xvii. In addition to the work of the above mentioned safety and health committee, consultation and co-operation among the three parties concerned, that is Government, Employers and Workers or their representatives should be encouraged and procedure for such consultation and co-operation in finding solutions to safety problems at the port developed and supervised by Chief Inspector of Factories.

xix. Studies similar to this Dock Handling Accidents project but probably geared to include other aspects of safety and health at ports under KPA should be encouraged and carried out in the near future, possibly after three to five years henceforth. Such studies depict the trends in the safety and health situation at the ports, facilitating further improved safety and health standards at these places of work. Such studies should be carried

out by the Factories Inspectorate.

Conclusion:

Every practical project or study has an objective if not more and once successfully carried out and results obtained, recommendations made should be carried out in order to achieve the desired goal or goals. In the field of safety, accidents and incidents resulting in injury to personnel and/or property damage are considered to be caused by either or both human and technological error. Efforts to alleviate these accidents and incidents is maximised when there is enough consultation and co-operation between government officials concerned, employers and workers or their representatives having in mind that each party has a crucial role to play and that most accidents and incidents causing injury and property damage are generally avoidable.

MONTHLY EVOLUTION OF GENERAL CARGO IN DEADWEIGHT TONNE (DWT)

MONTH

YEAR	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
1978	177403	17983	237388	188433	166099	166588	187921	153542	155529	115616	190880	152842	2072024
1979	157768	120383	172955	148311	174223	171320	164230	147662	131946	190507	190114	120919	1890338
1980	252615	212314	170032	182554	201651	146862	168037	209732	121769	233916	146090	165104	2210677
1981	162233	123806	218914	200950	168331	182086	149240	101976	175901	274239	208573	159503	2125752
1982	194949	215347	216641	171295	201994	174278	170534	189352	215745	174580	191822	136917	2253454
1983	183301	189007	230904	234860	208617	223242	200951	283644	239637	218368	196054	207192	2615417
1984	210037	228422	190292	207749	216180	190414	168110	189899	200064	289072	316198	296456	2704723
1985	223400	228748	191025	225689	224619	171517	241080	229009	175019	252759	192146	208043	2563054

MONTHLY EVOLUTION OF DRY BULK CARGO IN DEADWEIGHT TONNE (DWT)

MONTH

YEAR	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
1978	28278	98776	84525	74872	99128	43439	83127	44532	97047	121136	53082	65506	993448
1979	63452	38628	51043	56457	57206	105539	41813	31826	89185	62605	58616	93353	749737
1980	58587	58490	97465	123296	113720	143061	156155	101285	174381	66080	62607	75507	1230634
1981	113150	60964	83366	14870	118061	127954	135422	169083	155115	200132	69337	84068	1465522
1982	49511	114137	60538	98023	57665	82476	73786	109624	181596	60363	76207	111399	1075325
1983	87408	65417	80012	84313	58349	75980	84899	100828	95760	69564	63739	65396	931665
1984	43051	98528	85238	90754	29802	16000	10617	42116	102247	67068	66960	55688	807469
1985	101855	58242	63820	68778	129574	78806	172913	78413	186604	92552	80502	62838	1174897

MONTHLY EVOLUTION OF BULK LIQUID CARGO IN DEADWEIGHT TONNE (DWT)

MONTH

YEAR	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
1978	467378	120917	209056	129765	199067	414618	244538	388623	379826	105983	244982	196588	3101341
1979	406643	133707	165459	367602	544297	149307	142311	467734	97994	275708	144358	400772	3295892
1980	99830	616283	368412	321937	290592	418218	209728	386077	425975	348064	242465	338236	4065818
1981	199407	643895	454194	331737	321990	695453	514975	257562	316167	233295	480913	292809	4841292
1982	312339	92066	498071	255722	313750	493983	294007	180306	115025	322877	180229	325880	3394325
1983	192548	191003	238310	266668	182252	438675	276279	199747	283593	386566	302295	133835	3091771
1984	253254	318056	352271	301587	229783	180915	191899	133627	364644	202203	185100	309950	3023289
1985	225791	223789	272634	111373	242725	259444	238932	200089	256061	171063	181433	192996	2576330

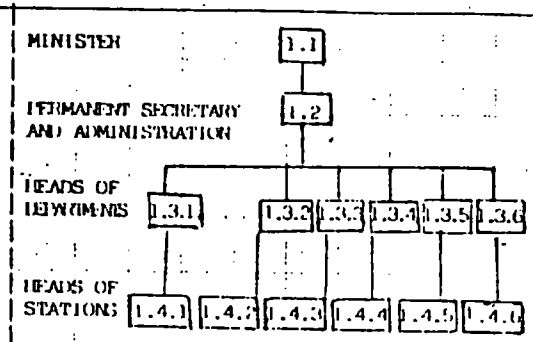
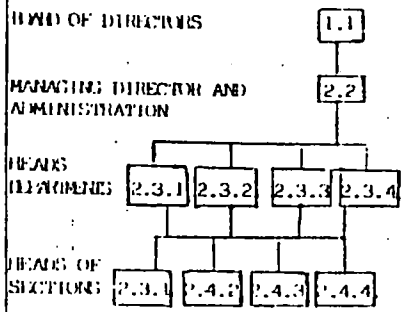
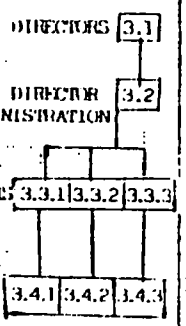
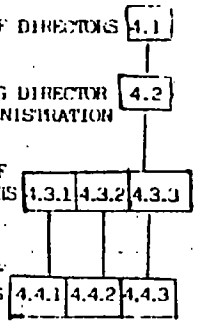
MONTHLY EVOLUTION OF CONTAINERISED CARGO IN TWENTY FOOT EQUIVALENT UNIT (T.E.V.)

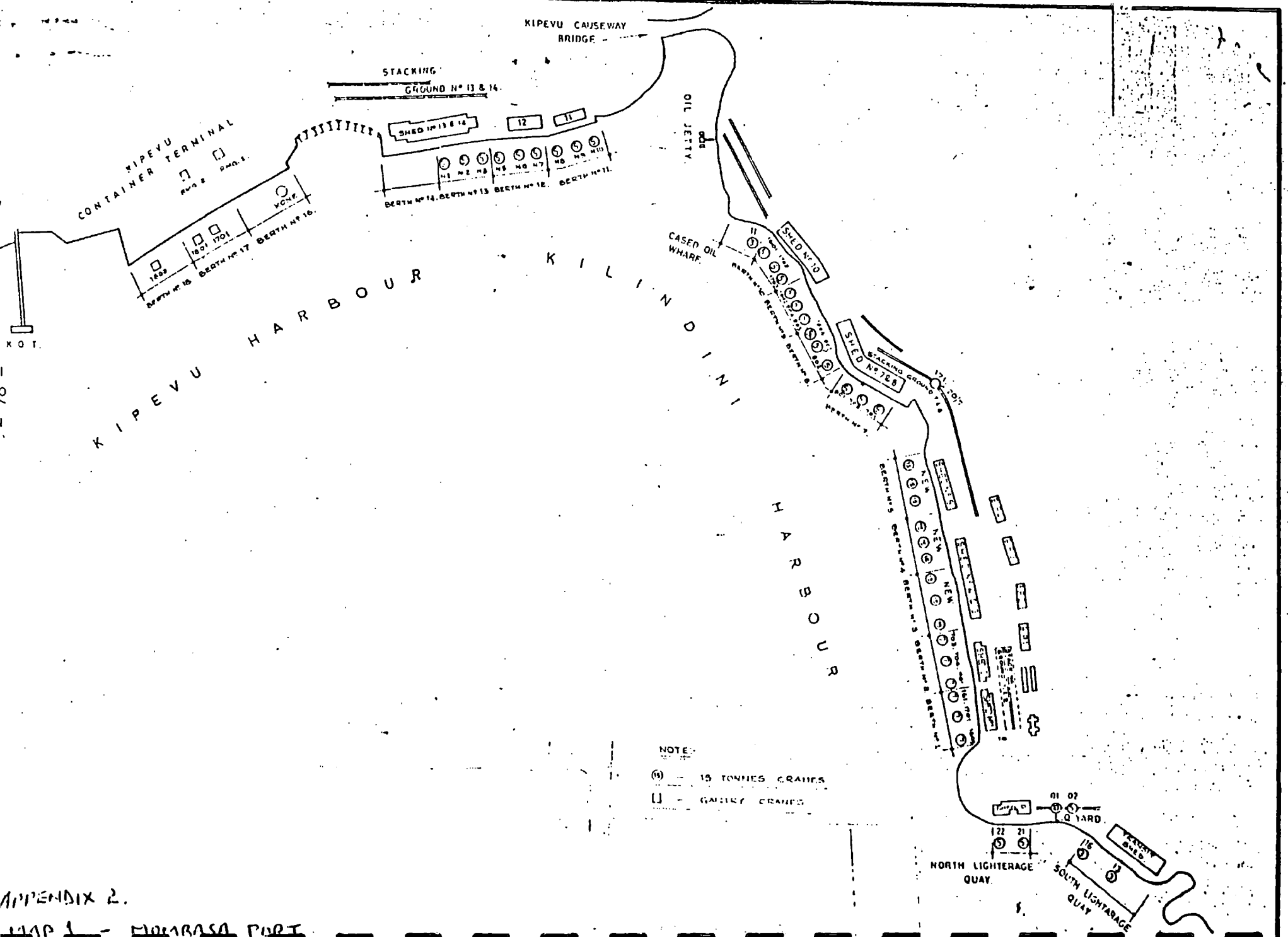
YEAR	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
1978	435	552	546	591	493	746	571	914	763	755	1593	1002	8961
1979	1043	998	953	966	1414	1214	1463	1168	1415	1628	1786	1101	1549
1980	1885	1659	2038	1610	2233	3242	2781	3046	2429	2217	4542	2978	30660
1981	2777	2539	2915	3225	3468	3592	3879	4590	3889	4400	4973	3836	44083
1982	4786	4703	3972	4684	5157	4514	4930	4044	7320	4201	4411	4923	57645
1983	6156	6133	7590	6167	7247	6194	7260	5792	7590	8527	7524	7669	83849
1984	7538	6913	8525	9146	8421	6382	7720	8111	6638	7873	8448	6745	92460
1985	8356	7815	8586	6400	9746	7840	10495	9440	6281	11234	8643	8526	103362

YEARLY TRANSIT GOODS IN DEADWEIGHT TONNE

COUNTRY

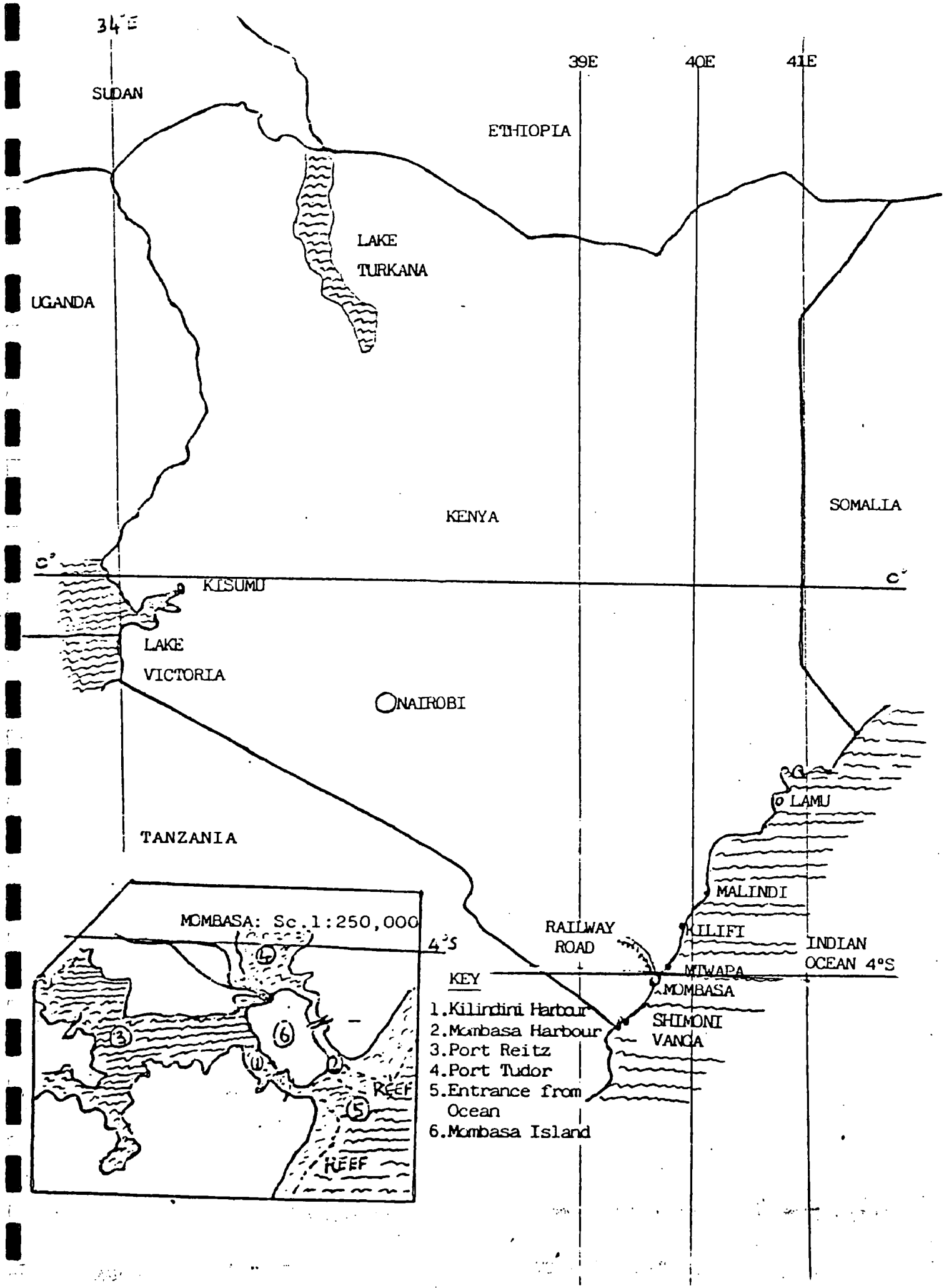
YEAR	UGANDA	TANZANIA	BURUNDI	RWANDA	SUDAN	ZAIRE	OTHERS	TOTAL
1978	189826	5533	6048	105490	4458	59453	1878	372686
1979	226027	1720	20464	116859	3421	29612	233	398336
1980	227511	437	16909	87551	4482	18916	2253	358059
1981	181722	660	23855	118771	7769	17260	3851	353888
1982	256583	1388	46367	124783	14659	41606	-	485386
1983	280983	2534	38104	114877	17114	41469	91	495172
1984	256103	3384	28943	156564	5267	28142	-	478403
1985	224342	3209	21787	94298	1729	33773	1597	380735

ORGANISATION	MINISTRY OF LABOUR (MOL)	KENYA PORTS AUTHORITY (KPA)	KENYA CARGO HANDLING SERVICES(KCHS)	KENYA RAILWAYS COORDORATION (KRC)
ORGANISATIONAL STRUCTURE				
MAIN FUNCTIONS	Mangement of conditions of work and terms of employment.	Provision of facilities and services for dock work	Handling cargo to and out of the port.	Provision of railway transportation of cargo
SECTIONS AND THEIR FUNCTIONS	1.1 MINISTER:-Parliamentary issues and guidelines. 1.2 PERMANENT SECRETARY AND ADMINISTRATION:- i Administration Mangement ii Personnel Mangement iii Finance Mangement 1.3.1. LABOUR AND INDUSTRIAL RELATIONS:- i Labour exchange services ii Regulation of terms of employment 1.3.2 INDUSTRIAL COURT:- Reconciliation of labour disputes 1.3.3 MANPOWER DEVELOPMENT:-Processing of data on manpower employment. 1.3.4 DIRECTORATE OF INDUSTRIAL TRAINING:-Upgrading of industrial skills 1.3.5 FACTORIES INSPECTORATE:-Occupational safety and health services. 1.3.6 NATIONAL SOCIAL SECURITY FUND:- Processing of retirement benefits	2.1 BOARD OF DIRECTORS: Policy guidelines 2.2 MANAGING DIRECTOR AND ADMINISTRATION i Administration management ii Personnel Mangement iii Finance Mangement 2.3.1 PLANNING:-Processing of data on operation research 2.3.2 STATION:-Organisation, operation and provision of services. 2.3.3 ENGINEERING: Provision of engineering services 2.3.4 LEGAL SECRETARY:- Provision of legal services	3.1 BOARD OF DIRECTORS: guidelines 3.2. MANAGING DIRECTOR AND ADMINISTRATION i Administration Mgt. ii Personnel Mangement iii Finance Mangement 3.3.2 TECHNICAL SERVICES:- Provision of engineering services 3.3.3 LEGAL SECRETARY:- Provision of legal services.	4.1 BOARD OF DIRECTORS:- Policy guidelines 4.2. MANAGING DIRECTOR AND ADMINISTRATION i Administration Mangement ii Personnel Mangement iii Finance Mangement 4.3.1 DISTRICT MGR:- i Provision of railway facilities and services 4.3.2 DISTRICT TRAFFIC:- i Provision of transport ii Collection of revenue 4.3.3 DISTRICT ENGINEER:- Provision of engineering services
RELATIONSHIP	Employes of KPA, KCHS, and KRC are subject to labour laws enforced by Ministry of Labour	Provides facilities and services for KRC and KCHS. Required to comply with labour laws	Handles cargo on behalf of KPA in co-operation with KRC.Required to comply with labour laws	Provides railway transport facilities to KPA and KCHS. Required to comply with labour laws.
OTHERS	As Government Ministry participates in labour Advisory Board drafting labour laws	The Board of Directors and workers representatives participate in L.A.B.	The Board of Directors and workers representatives participate in L.A.B.	The Board of Directors and workers representatives participate in L.A.B.



APPENDIX 2.

MAP 1 - MOMBASA PORT


34°E
39E
40E
41E
SUDAN
ETHIOPIA
LAKE
TURKANA
UGANDA
KENYA
SOMALIA
0°
KISUMU
LAKE
VICTORIA
NAIROBI
LAMU
TANZANIA
MALINDI
MOMBASA: Sc.1:250,000
4°S
RAILWAY
ROAD
KILIFI
INDIAN
OCEAN 4°S
MTWAPA
MOMBASA
SHIMONI
VANGA
KEY
1.Kilindini Harbour
2.Mombasa Harbour
3.Port Reitz
4.Port Tudor
5.Entrance from Ocean
6.Mombasa Island
REEF
REEF

MONTHLY EVOLUTION OF REPORTED ACCIDENTS TO INDIVIDUALS AT THE PORT

YEAR / ACC / MONTH	1978		1979		1980		1981		1982		1983		1984		1985		TOTAL	
	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F
JANUARY	101		90		89		71		65		37		53		42		548	0
FEBRUARY	123		63		86		64	1	64		44		46	1	34		524	2
MARCH	96		79	1	75		68		59	1	59		61		30	1	527	3
APRIL	96		79	1	75		68		59	1	59		61		30	1	527	3
MAY	113		73		89		73		70		60		41		52		571	0
JUNE	102		93		67		69		57		38		22		33		481	0
JULY	108		62		35		59		44		41		25		52		426	0
AUGUST	115		65		64		61		46	1	46		42		31		470	1
SEPTEMBER	78	1	68		88		93		57		80		43		25		501	1
OCTOBER	88		83		90		88		62		44		57		35		556	0
NOVEMBER	86		86		84		80		51		43		59		22		511	0
DECEMBER	99		64		71		57	1	39		33		32		17		412	1
TOTAL	1105	2	888	1	922	0	888	2	688	2	946	0	536	1	411	1	6116	9
FACTORIES INSP. RECEIPTS	158	6	149	2	62	3	7	0	19	0	35	0	40	1	–	–	470	12

TABLE B

YEARLY REPORTED ACCIDENTS TO MECHANICAL HANDLING EQUIPMENT AT THE PORT

YEAR	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NO.OF ACC.	285	228	254	320	249	147	206	133	1822

FORMAT 1

Form type	Sheet No.	
1	2	3

ACCIDENT DATA ON INDIVIDUALS

Name of victim .....

Category		A/C. No.					Date of birth		Organi-sation	Section Department	
4	5	6	7	8	9	10	11	12	13	14	15

Date of Employment			Date of accident					
(month)	(year)		(day)	(month)	(year)		(time)	
16	17	18	19	20	21	22	23	24	25	26	27

Place of accident	Cause of accident	Part injured	Days lost	
28	29	30	31	32

Materials handled
33

APPENDIX 3
FORMAT 2

Form type	Sheet No.	
1	2	3

EQUIPMENT DATA

Organisation	Equipment type		Equipment Identification						Year commissioned	
4	5	6	7	8	9	10	11	12	13	14

First Accident

Day		Month		Year		Time		Place	
15	16	17	18	19	20	21	22	23	24

Cause		No. of accidents		No. of services		No. of inspections		No. of repairs	
25	26	27	28	29	30	31	32	33	34

Types of control

leavers	steering wheel	Clutch	Handle	Jack stick	brakes	Others
35	36	37	38	39	40	41

Safety Devices

O/W/S	O/L/S	T/L	L/T/L	L/T	L/R/I	A/S/L/I
42	43	44	45	46	47	48

V/I	S/I	O/L/P	A/B	L/T	Others
49	50	51	52	53	54

Manual provided	Content explained	Manual available
55	56	57

APPENDIX 4

MINISTRY OF LABOUR FACTORY INSPECTORATE
SURVEY OF INDUSTRIAL ACCIDENTS
****

TABLE 4 ... YEAR OF ACCIDENT BY SECTION

	-78	79	80	81	82	83	84	85	TOTAL	Missing Values
A	86	106	105	106	73	62	72	44	654	-
B	91	62	78	76	36	54	45	45	487	-
C	93	75	64	30	37	42	46	31	418	1
D	128	108	120	87	57	47	51	67	665	-
E	126	103	117	94	51	42	40	16	589	1
F	12	15	16	20	23	16	18	17	137	-
G	144	41	67	27	28	19	16	15	357	-
H	176	122	127	100	98	46	65	67	801	-
I	0	0	2	0	8	1	0	0	11	-
J	97	86	98	119	41	10	6	7	464	-
K	102	114	95	94	78	61	87	60	691	-
C.T.	0	0	0	1	0	0	9	14	24	-
OPERATIONS	4	1	0	2	6	5	5	5	28	1
ENGINEERING	7	0	0	9	38	13	8	13	88	-
OTHER	50	28	17	29	19	41	13	10	207	2
	1116	861	906	794	593	459	481	411	5621	
MISSING VALUES 1(C)	-	-	2	-	-	-	-	-		

(C) = common to both
GRAND TOTAL = 5629

... YEAR OF ACCIDENT BY SECTION (%'S)

	-78	79	80	81	82	83	84	85	TOTAL
A	13.1	16.2	16.1	16.2	11.2	9.5	11	6.7	100
B	18.7	12.7	16	15.6	7.4	11.1	9.2	9.2	100
C	22.2	17.9	15.3	7.2	8.9	10	11	7.4	100
D	19.2	16.2	18	13.1	8.6	7.1	7.7	10.1	100
E	21.4	17.5	19.9	16	8.7	7.1	6.8	2.7	100
F	8.8	10.9	11.7	14.6	16.8	11.7	13.1	12.4	100
G	40.3	11.5	18.8	7.6	7.8	5.3	4.5	4.2	100
H	22	15.2	15.9	12.5	12.2	5.7	8.1	8.4	100
I	0	0	18.2	0	72.7	9.1	0	0	100
J	20.9	18.5	21.1	25.6	8.8	2.2	1.3	1.5	100
K	14.8	16.5	13.7	13.6	11.3	8.8	12.6	8.7	100
C.T.	0	0	0	4.2	0	0	37.5	58.3	100
OPERATIONS	14.3	3.6	0	7.1	21.4	17.9	17.9	17.9	100
ENGINEERING	8	0	0	10.2	43.2	14.8	9.1	14.8	100
OTHER	24.2	13.5	8.2	14	9.2	19.8	6.3	4.8	100

APPENDIX 4

MINISTRY OF LABOUR FACTORY INSPECTORATE

SURVEY OF INDUSTRIAL ACCIDENTS

****

TABLE 5 ... PLACE OF ACCIDENT BY CAUSE OF ACCIDENT

	BERTH	SHED	YARD	OTHER	TOTAL	MISSING VALUES
FO	809	387	114	153	1463	3
FP	461	195	77	112	845	2
SO	211	105	36	42	394	-
HO	666	234	120	149	1169	3
HC	749	232	73	102	1156	-
CS	116	51	13	22	202	-
OC	134	102	36	110	382	1
	3146	1306	469	690	5611	
MISSING VALUES 2(C)	6	-	1	-		

(C) = Common to both

GRAND TOTAL = 5629

... PLACE OF ACCIDENT BY CAUSE OF ACCIDENT (%'S)

	BERTH	SHED	YARD	OTHER
FO	25.7	29.6	24.3	22.2
FP	14.7	14.9	16.4	16.2
SO	6.7	8	7.7	6.1
HO	21.2	17.9	25.6	21.6
HC	23.8	17.8	15.6	14.8
CS	3.7	3.9	2.8	3.2
OC	4.3	7.8	7.7	15.9
	100	100	100	100

APPENDIX 4

MINISTRY OF LABOUR FACTORY INSPECTORATE
SURVEY OF INDUSTRIAL ACCIDENTS
****

TABLE 6 ... MATERIAL HANDLED BY CAUSE OF ACCIDENT

	GEN. CARGO	BULK DRY	BULK LIQD	CONTR	OTHER	TOTAL	MISSING VALUES
FO	600	435	80	45	293	1453	13
FP	153	162	31	36	389	771	76
SO	107	35	1	8	217	368	26
HO	314	223	52	69	485	1143	29
HC	612	304	76	38	124	1154	2
CS	16	103	40	4	34	197	5
OC	6	24	5	3	180	218	165
	1808	1286	285	203	1722	5304	
MISSING VALUES 8(C)	-	-	-	1	-		

(C) = common to both
GRAND TOTAL = 5629

... MATERIAL HANDLED BY CAUSE OF ACCIDENT (%'S)

	GEN. CARGO	BULK DRY	BULK LIQD	CONTR	OTHER
FO	33.2	33.8	28.1	22.2	17
FP	8.5	12.6	10.9	17.7	22.6
SO	5.9	2.7	.4	3.9	12.6
HO	17.4	17.3	18.2	34	28.2
HC	33.8	23.6	26.7	18.7	7.2
CS	.9	8	14	2	2
OC	.3	1.9	1.8	1.5	10.5
	100	100	100	100	100

MINISTRY OF LABOUR FACTORY INSPECTORATE
SURVEY OF INDUSTRIAL ACCIDENTS
****

TABLE 7 ... MONTH OF ACCIDENT BY SECTION

	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL	MISSING VALUES
A	66	54	59	52	62	54	37	52	66	59	53	39	653	1
B	57	34	35	35	49	43	34	41	30	53	40	36	487	-
C	50	34	28	30	30	44	39	39	31	34	31	28	419	1
D	72	50	35	49	65	50	59	37	52	70	90	36	665	-
E	40	56	69	51	47	51	38	46	46	50	46	49	539	1
F	7	12	11	7	10	9	8	12	22	15	13	11	137	-
G	46	39	22	35	46	23	20	22	33	29	20	22	357	-
H	39	83	89	86	84	56	70	47	76	68	57	46	801	-
I	8	0	0	0	0	0	0	1	0	2	0	0	11	-
J	23	40	38	23	51	44	23	40	39	52	50	41	464	-
K	48	57	55	55	76	52	45	66	63	62	56	56	691	-
C.T.	1	2	1	0	3	2	1	4	3	3	2	2	24	-
OPERATIONS	3	1	1	0	3	4	3	2	5	3	3	0	28	1
ENGINEERING	8	1	10	6	15	9	8	7	5	8	7	4	88	-
OTHER	11	21	21	15	10	16	16	22	27	21	15	12	207	2
	479	484	474	444	551	457	401	438	498	529	483	382	5620	
MISSING VALUES	1	-	-	-	-	-	1	-	-	-	-	1		

GRAND TOTAL = 5629

... MONTH OF ACCIDENT BY SECTION (%'S)

	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
A	10.1	8.3	9	8	9.5	8.3	5.7	8	10.1	9	8.1	6	100
B	11.7	7	7.2	7.2	10.1	8.8	7	8.4	6.2	10.9	8.2	7.4	100
C	12	8.1	6.7	7.2	7.2	10.5	9.3	9.3	7.4	8.1	7.4	6.7	100
D	10.8	7.5	5.3	7.4	9.8	7.5	8.9	5.6	7.8	10.5	13.5	5.4	100
E	6.8	9.5	11.7	8.7	8	8.7	6.5	7.8	7.8	8.5	7.8	8.3	100
F	5.1	8.8	8	5.1	7.3	6.6	5.8	8.8	16.1	10.9	9.5	8	100
G	12.9	10.9	6.2	9.8	12.9	6.4	5.6	6.2	9.2	8.1	5.6	6.2	100
H	4.9	10.4	11.1	10.7	10.5	7	8.7	5.9	9.5	8.5	7.1	5.7	100
I	72.7	0	0	0	0	0	0	9.1	0	18.2	0	0	100
J	5	8.6	8.2	5	11	9.5	5	8.6	8.4	11.2	10.8	8.8	100
K	6.9	8.2	8	8	11	7.5	6.5	9.6	9.1	9	8.1	8.1	100
C.T.	4.2	8.3	4.2	0	12.5	8.3	4.2	16.7	12.5	12.5	8.3	8.3	100
OPERATIONS	10.7	3.6	3.6	0	10.7	14.3	10.7	7.1	17.9	10.7	10.7	0	100
ENGINEERING	9.1	1.1	11.4	6.8	17	10.2	9.1	8	5.7	9.1	8	4.5	100
OTHER	5.3	10.1	10.1	7.2	4.8	7.7	7.7	10.6	13	10.1	7.2	5.8	100

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TABLE 8 ... DAY OF ACCIDENT BY SECTION

	1-	6-	11-	16-	21-	26-	TOTAL	MISSING VALUES
A	131	111	101	93	121	90	647	7
B	86	94	69	75	95	66	485	2
C	98	57	62	77	59	60	413	6
D	136	101	93	85	141	100	656	9
E	117	96	98	88	108	78	585	5
F	38	22	21	10	24	20	135	2
G	81	49	43	52	67	58	350	7
H	174	121	101	108	146	143	793	8
I	3	1	3	1	2	0	10	1
J	114	63	61	69	93	61	461	3
K	159	112	100	92	132	87	682	9
C. T.	6	2	8	2	3	3	24	-
OPERATIONS	8	5	2	6	2	5	28	1
ENGINEERING	15	15	22	9	11	16	88	-
OTHER	47	37	30	33	25	32	204	5
	1213	886	814	800	1029	819	5561	
MISSING VLUES 1(C)	-	-	1	-	-	1		

(C) = Common to both
GRAND TOTAL = 5629

... DAY OF ACCIDENT BY SECTION (%'S)

	1-	6-	11-	16-	21-	26-	TOTAL
A	20.2	17.2	15.6	14.4	18.7	13.9	100
B	17.7	19.4	14.2	15.5	19.6	13.6	100
C	23.7	13.8	15	18.6	14.3	14.5	100
D	20.7	15.4	14.2	13	21.5	15.2	100
E	20	16.4	16.8	15	18.5	13.3	100
F	28.1	16.3	15.6	7.4	17.8	14.8	100
G	23.1	14	12.3	14.9	19.1	16.6	100
H	21.9	15.3	12.7	13.6	18.4	18	100
I	30	10	30	10	20	0	100
J	24.7	13.7	13.2	15	20.2	13.2	100
K	23.3	16.4	14.7	13.5	19.4	12.8	100
C. T.	25	8.3	33.3	8.3	12.5	12.5	100
OPERATIONS	28.6	17.9	7.1	21.4	7.1	17.9	100
ENGINEERING	17	17	25	10.2	12.5	18.2	100
OTHER	23	18.1	14.7	16.2	12.3	15.7	100

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****

TABLE 9 ... HOUR OF ACCIDENT BY SECTION

	0-	5-	10-	15-	20-	TOTAL	MISSING VALUES
A	62	131	182	201	28	604	50
B	36	105	129	142	22	434	53
C	55	71	109	87	24	346	73
D	54	124	194	206	25	603	62
E	59	93	134	159	23	468	122
F	10	26	41	38	4	119	18
G	28	74	114	85	17	318	39
H	54	145	239	240	45	723	78
I	2	2	2	4	0	10	1
J	40	84	141	116	29	410	54
K	40	144	197	197	33	611	80
C.T.	1	4	5	9	3	22	2
OPERATIONS	4	10	8	4	2	28	1
ENGINEERING	3	33	48	3	1	88	-
OTHER	17	68	49	40	8	182	27
	465	1114	1592	1531	264	4966	
MISSING VALUES 1(C)	-	-	-	2	-		

(C) = Common to both
GRAND TOTAL = 5629

HOUR OF ACCIDENT BY SECTION (%'S)

	0-	5-	10-	15-	20-	TOTAL
A	10.3	21.7	30.1	33.3	4.6	100
B	8.3	24.2	29.7	32.7	5.1	100
C	15.9	20.5	31.5	25.1	6.9	100
D	9	20.6	32.2	34.2	4.1	100
E	12.6	19.9	28.6	34	4.9	100
F	8.4	21.8	34.5	31.9	3.4	100
G	8.8	23.3	35.8	26.7	5.3	100
H	7.5	20.1	33.1	33.2	6.2	100
I	20	20	20	40	0	100
J	9.8	20.5	34.4	28.3	7.1	100
K	6.5	23.6	32.2	32.2	5.4	100
C.T.	4.5	18.2	22.7	40.9	13.6	100
OPERATIONS	14.3	35.7	28.6	14.3	7.1	100
ENGINEERING	3.4	37.5	54.5	3.4	1.1	100
OTHER	9.3	37.4	26.9	22	4.4	100

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TABLE 10 ... CAUSE OF ACCIDENT BY EXPERIENCE OF OPERATOR

	FO	FP	SO	HO	HC	CS	OC	TOTAL	MISSING VALUES
0-4 YRS	263	126	73	212	208	29	52	963	2
5-9 YRS	241	122	48	173	250	32	58	924	1
10-14 YRS	178	111	47	143	137	33	53	702	-
15-19 YRS	271	158	89	196	227	37	92	1070	2
20-24 YRS	314	215	92	278	212	49	65	1225	4
25-29 YRS	107	69	20	109	61	18	40	424	-
30+ YRS	11	18	3	18	10	1	4	65	-
	1460	1020	703	1461	1167	199	364	5373	
MISSING VALUES	81	28	22	43	51	3	19		

GRAND TOTAL = 5629

% ... CAUSE OF ACCIDENT BY EXPERIENCE OF OPERATOR

	FO	FP	SO	HO	HC	CS	OC
0-4 YRS	19	15.4	19.6	18.8	18.8	14.6	14.3
5-9 YRS	17.4	14.9	12.9	15.3	22.6	16.1	15.9
10-14 YRS	12.9	13.6	12.6	12.7	12.4	16.6	14.6
15-19 YRS	19.6	19.3	23.9	17.4	20.5	18.6	25.3
20-24 YRS	22.7	26.3	24.7	24.6	19.2	24.6	17.9
25-29 YRS	7.7	8.4	5.4	9.7	5.5	9	11
30+ YRS	.8	2.2	.8	1.6	.9	.5	1.1
	100	100	100	100	100	100	100

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SURVEY OF INDUSTRIAL ACCIDENTS

****

TABLE 11 ... AGE OF ACCIDENT VICTIM BY SECTION

	≤15	15–20–	25–	30–	35–	40–	45–	50–	55+	T
A	0	1 7	35	83	94	117	146	112	49	644
B	0	1 13	38	62	66	91	101	80	25	477
C	0	1 2	13	38	51	85	86	99	37	655
D	0	1 17	27	66	115	117	124	131	57	655
E	0	2 8	60	71	93	117	120	73	37	581
F	0	0 2	5	13	11	39	29	27	7	133
G	0	0 7	12	46	73	66	45	78	18	345
H	0	0 10	40	70	92	207	177	141	44	781
I	0	0 0	0	1	5	3	1	1	0	11
J	0	0 14	41	66	82	90	86	56	21	456
K	0	0 5	24	56	88	150	161	144	48	676
C.T.	1	0 0	1	1	7	4	4	5	1	24
OPERATIONS	0	0 5	4	4	4	4	4	1	0	26
ENGINEERING	0	1 6	16	24	21	11	4	1	0	84
OTHER	0	0 7	18	36	37	33	34	28	5	198
	1	7 103	334	637	839	1134	1155	944	349	5503

% ... AGE OF ACCIDENT VICTIM BY SECTION

										T
A	0	.2	1.1	5.4	12.9	14.6	18.2	22.7	17.4	7.6	100
B	0	.2	2.7	8	13	13.8	19.1	21.2	16.8	5.2	100
C	0	.2	.5	3.2	9.2	12.4	20.6	20.9	24	9	100
D	0	.2	2.6	4.1	10.1	17.6	17.9	18.9	20	8.7	100
E	0	.3	1.4	10.3	12.2	16	20.1	20.7	12.6	6.4	100
F	0	0	1.5	3.8	9.8	29.3	29.3	21.8	20.3	5.3	100
G	0	0	2	3.5	13.3	21.2	19.1	22.6	13	5.2	100
H	0	0	1.3	5.1	9	11.8	26.5	22.7	18.1	5.6	100
I	0	0	0	0	9.1	45.5	27.3	27.3	9.1	0	100
J	0	0	3.1	9	14.5	18	19.1	18.9	12.3	7.1	100
K	0	0	.7	3.6	8.3	13	22.2	23.8	21.3	7.1	100
C.T.	4.2	0	0	4.2	4.2	29.2	16.7	16.7	20.8	4.2	100
OPERATIONS	0	0	19.2	15.4	15.4	15.4	15.4	15.4	3.8	0	100
ENGINEERING	0	1.2	7.1	19	28.6	25	13.1	4.8	1.2	0	100
OTHER	0	0	3.5	9.1	18.2	18.7	16.7	17.2	14.1	25	100

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SURVEY OF INDUSTRIAL ACCIDENTS
****

TABLE 12 ... ORGANISATION BY YEAR OF ACCIDENT (MAN DAYS LOST)

	RAILWAYS	PORTS	CARGO HANDLING	TOTAL
-78	0	75	8335	8410
1979	0	8	6520	6528
1980	58	4	6734	6796
1981	12	216	7038	7266
1982	29	1385	4460	5874
1983	39	670	3743	4452
1984	92	259	4975	5326
1985	0	401	3931	4332
	230	3018	45736	48984

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SURVEY OF INDUSTRIAL ACCIDENTS
****

TABLE 13 ... YEAR OF ACCIDENT BY SECTION (MAN DAYS LOST)

	-78	79	80	81	82	83	84	85	TOTAL
A	639	719	806	984	633	597	632	507	5517
B	700	482	549	499	317	414	511	438	3910
C	697	525	516	319	355	284	529	380	3605
D	944	831	923	815	439	379	476	748	5555
E	968	772	937	921	387	364	305	287	4941
F	62	145	173	137	124	121	255	147	1164
G	1026	311	442	195	223	320	325	111	2953
H	1323	934	899	1065	818	390	908	481	6818
I	0	0	4	0	49	14	0	0	67
J	749	722	725	953	356	180	67	103	3855
K	795	896	636	677	739	487	635	475	5340
C.T.	0	0	0	29	0	0	276	146	451
OPERATIONS	39	0	0	0	17	154	93	185	488
ENGINEERING	64	0	0	216	1063	394	166	216	2119
OTHER	404	191	181	456	357	354	148	108	2199
	8410	6528	6791	7266	5877	4452	5326	4332	48982

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SURVEY OF INDUSTRIAL ACCIDENTS

TABLE 14 ... DAYS LOST BY SECTION

	0-	11-	21-	31-	41-	51-	61-	71-	81-	TOTAL
A	501	118	28	2	0	0	0	0	0	649
B	376	85	24	0	1	0	0	0	0	486
C	316	81	18	0	0	0	0	0	0	415
D	510	119	29	0	2	0	0	0	0	660
E	443	119	24	1	0	0	1	0	0	587
F	109	22	4	0	0	0	0	0	0	135
G	286	55	11	1	0	0	0	0	0	353
H	625	136	30	0	1	0	0	0	0	792
I	9	2	0	0	0	0	0	0	0	11
J	365	73	22	0	1	0	0	0	0	461
K	541	115	34	0	0	0	0	0	0	690
C.T.	12	8	2	0	0	0	0	0	0	22
OPERATIONS	17	3	4	0	1	2	0	0	0	27
ENGINEERING	34	15	11	9	11	0	1	2	1	84
OTHER	147	37	17	1	2	1	2	0	0	207
	4291	987	258	14	19	3	4	2	1	5579

DAYS LOST BY SECTION (%'S)

	0-	11-	21-	31-	41-	51-	61-	71-	81-	TOTAL
A	77.2	18.2	4.3	.3	0	0	0	0	0	100
B	77.4	17.5	4.9	0	.2	0	0	0	0	100
C	76.1	19.5	4.3	0	0	0	0	0	0	100
D	77.3	18	4.4	0	.3	0	0	0	0	100
E	75.5	20.1	4.1	.2	0	0	.2	0	0	100
F	80.7	16.3	3	0	0	0	0	0	0	100
G	81	15.6	3.1	.3	0	0	0	0	0	100
H	78.9	17.2	3.8	0	.1	0	0	0	0	100
I	81.8	18.2	0	0	0	0	0	0	0	100
J	79.2	15.8	4.8	0	.2	0	0	0	0	100
K	78.4	16.7	4.9	0	0	0	0	0	0	100
C.T.	54.5	36.4	9.1	0	0	0	0	0	0	100
OPERATIONS	63	11.1	14.8	0	3.7	7.4	0	0	0	100
ENGINEERING	40.5	17.9	13.1	10.7	13.1	0	1.2	2.4	1.2	100
OTHER	71	17.9	8.2	.5	1	.5	1	0	0	100

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TABLE 17... YEAR COMMISSIONED BY EQUIPMENT TYPE

	BEFORE 1977	77	78	79	80	81	82	83	84	85	86	TOTAL
CRANES .. CONTRAINER	0	0	0	2	0	0	0	6	2	0	0	8
P.E. TRAVELLING	15	6	0	0	0	2	0	0	1	0	1	24
P.E. FIXED	2	1	0	0	0	0	0	0	0	0	0	3
E.O. TRAVELLING	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE	6	2	1	0	0	6	0	0	0	1	0	16
FLOATING	1	0	0	0	0	0	0	0	0	0	0	1
UNDERHUNG JIB	5	0	0	0	0	0	0	0	0	0	0	5
O/H BELT CONVEYOR	0	0	0	0	0	0	0	0	0	0	0	0
TRACTOR	10	0	3	0	2	10	6	0	0	1	0	32
TRAILER	0	0	0	0	0	1	0	0	0	0	0	1
FORKLIFT TRUCK	12	0	0	7	0	2	13	1	5	1	0	41
	52	9	4	7	2	19	19	7	8	3	1	131

... YEAR COMMISSIONED BY EQUIPMENT TYPE (%'S)

	BEFORE 1977	77	78	79	80	81	82	83	84	85	86	TOTAL
CRANES .. CONTAINER	0	0	0	0	0	0	0	75	25	0	0	100
P.E. TRAVELLING	66.7	25	0	0	0	0	0	0	4.2	0	4.2	100
P.E. FIXED	66.7	33.3	0	0	0	0	0	0	0	0	0	100
E.O. TRAVELLING	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE	37.5	12.5	6.3	0	0	37.5	0	0	0	6.3	0	100
FLOATING	100	0	0	0	0	0	0	0	0	0	0	0
UNDERHUNG JIB	100	0	0	0	0	0	0	0	0	0	0	100
O/H BELT CONVEYOR	0	0	0	0	0	0	0	0	0	0	0	0
TRACTOR	31.3	0	9.4	0	6.3	31.3	18.8	0	0	3.1	0	100
TRAILER	0	0	0	0	0	100	0	0	0	0	0	0
FORKLIFT TRUCK	29.3	0	0	17.1	0	4.9	31.7	2.4	12.2	2.4	0	100

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TABLE 18... EQUIPMENT AGE AT 1ST ACCIDENT BY CAUSE OF ACCIDENT

	0	1	2	3	4	5	6	7	8	9	10	TOTAL
S	3	2	3	1	0	0	1	1	1	0	4	16
T	0	0	0	0	0	0	1	0	0	0	0	1
H	6	12	11	3	2	4	1	0	1	2	4	46
C	0	2	1	2	0	0	0	0	0	0	2	7
F	0	0	1	0	0	0	0	1	1	0	1	4
D	0	1	1	1	2	0	0	1	0	0	1	7
M	4	2	0	2	1	0	1	0	0	0	3	13
	13	19	17	9	5	4	4	3	3	2	15	94

... EQUIPMENT AGE AT 1ST ACCIDENT BY CAUSE OF ACCIDENT (%'S)

	0	1	2	3	4	5	6	7	8	9	10	TOTAL
S	18.8	12.5	18.8	6.3	0	0	6.3	6.3	6.3	0	25	100
T	0	0	0	0	0	0	100	0	0	0	0	0
H	13	26.1	23.9	6.5	4.3	8.7	2.2	0	2.2	4.3	8.7	100
C	0	28.6	14.3	28.6	0	0	0	0	0	0	28.6	100
F	0	0	25	0	0	0	0	25	25	0	25	100
D	0	14.3	14.3	14.3	28.6	0	0	14.3	0	0	14.3	100
M	30.8	15.4	0	15.4	7.7	0	7.7	0	0	0	23.1	100

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TABLE 19 ... ORGANISATION BY EQUIPMENT TYPE - NUMBER ACCIDENTS

	RAILWAYS	PORTS	CARGO HANDLING	TOTAL
CRANES .. CONTAINER	0	25	0	25
P.E. TRAVELLING	0	97	0	97
P.E. FIXED	0	2	0	2
E.O. TRAVELLING	0	0	0	0
MOBILE	0	14	0	14
FLOATING	0	11	0	11
UNDERHUNG JIB	0	1	0	1
O/H BELT CONVEYOR	0	0	0	0
TRACTOR	0	0	62	62
TRAILER	0	0	1	1
FORKLIFT TRUCK	0	0	92	92
	0	150	155	305

... ORGANISATION BY EQUIPMENT TYPE - % ACCIDENTS

	RAILWAYS	PORTS	CARGO HANDLING
CRANES .. CONTAINER	0	16.7	0
P.E. TRAVELLING	0	64.7	0
P.E. FIXED	0	1.3	0
E.O. TRAVELLING	0	0	0
MOBILE	0	9.3	0
FLOATING	0	7.3	0
UNDERHUNG JIB	0	.7	0
O/H BELT CONVEYOR	0	0	0
TRACTOR	0	0	40
TRAILER	0	0	.6
FORKLIFT TRUCK	0	0	59.4
	0	100	100

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TABLE 20 ... PLACE OF ACCIDENT BY CAUSE

	BERTH	SHED	YARD	OTHER	TOTAL
S	10	4	5	2	21
T	1	0	0	0	1
H	19	8	20	6	53
C	5	0	1	4	11
F	1	0	3	0	4
D	2	5	3	2	12
M	8	1	4	1	14
	47	18	36	15	116

... PLACE OF ACCIDENT BY CAUSE (%'S)

	BERTH	SHED	YARD	OTHER	TOTAL
S	47.5	19	23.8	9.5	100
T	100	0	0	0	0
H	35.8	15.1	37.7	11.3	100
C	54.5	0	9.1	36.4	100
F	25	0	75	0	100
D	16.7	41.7	25	16.7	100
M	57.1	7.1	28.6	7.1	100

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TABLE 21 ... PLACE OF 1ST ACCIDENT BY EQUIPMENT TYPE

	BERTH	SHOP	YARD	OTHER	TOTAL
CRANES .. CONTAINER	3	0	1	0	4
P.E. TRAVELLING	13	0	6	0	19
P.E. FIXED	1	0	0	0	1
E.O. TRAVELLING	0	0	0	0	0
MOBILE	0	0	3	0	3
FLOATING	1	0	0	0	1
UNDERHUNG JIB	1	0	0	0	1
O/H BELT CONVEYOR	0	0	0	0	0
TRACTOR	10	8	8	7	33
TRAILER	1	0	0	0	1
FORKLIFT TRUCK	17	10	15	8	50
	47	18	38	15	118

PLACE OF 1ST ACCIDENT BY EQUIPMENT TYPE (%'S)

	BERTH	SHOP	YARD	OTHER
CRANES .. CONTAINER	6.4	0	2.6	0
P.E. TRAVELLING	27.7	0	15.8	0
P.E. FIXED	2.1	0	0	0
E.O. TRAVELLING	0	0	0	0
MOBILE	0	0	21.1	0
FLOATING	2.1	0	0	0
UNDERHUNG JIB	2.1	0	0	0
O/H BELT CONVEYOR	0	0	0	0
TRACTOR	21.3	44.4	21.1	46.7
TRAILER	2.1	0	0	0
FORKLIFT TRUCK	36.2	55.6	39.5	53.3
	100	100	120	120

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TABLE 22 ... MONTH OF ACCIDENT BY CAUSE

	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
S	2	2	1	1	1	3	2	2	2	2	3	0	21
T	0	0	0	1	0	0	0	0	0	0	0	0	1
H	5	2	6	5	3	5	3	3	6	6	3	6	53
C	1	0	1	3	0	1	1	1	3	0	0	0	11
F	0	0	2	0	0	0	1	0	1	0	0	0	4
D	1	1	1	0	1	1	1	1	2	1	1	1	12
M	1	2	2	1	1	1	1	1	2	1	1	0	14
	10	7	13	11	6	11	9	8	16	10	8	7	116

... MONTH OF ACCIDENT BY CAUSE (%'S)

	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
S	9.5	9.5	4.8	4.8	4.8	14.3	9.5	9.5	9.5	9.5	14.3	0	100
T	0	0	0	100	0	0	0	0	0	0	0	0	0
H	9.4	3.8	11.3	9.4	5.7	9.4	5.7	5.7	11.3	11.3	5.7	11.3	100
C	9.1	0	9.1	27.3	0	9.1	9.1	9.1	27.3	0	0	0	100
F	0	0	50	0	0	0	25	0	25	0	0	0	100
D	8.3	8.3	8.3	0	8.3	8.3	8.3	8.3	16.7	8.3	8.3	8.3	100
M	7.1	14.3	14.3	7.1	7.1	7.1	7.1	7.1	14.3	7.1	7.1	0	100

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****

TABLE 23 ... DAY OF ACCIDENT BY CAUSE

	1-	6-	11-	16-	21-	26-	TOTAL
S	3	6	6	2	2	2	21
T	1	0	0	0	0	0	1
H	4	13	8	8	7	13	53
C	0	2	1	3	1	4	11
F	0	0	1	0	2	1	4
D	1	2	1	1	3	4	12
M	1	2	1	2	3	5	14
	10	25	18	16	18	29	116

... DAY OF ACCIDENT BY CAUSE (%'S)

	1-	6-	11-	16-	21-	26-	TOTAL
S	14.3	28.6	28.6	9.5	9.5	9.5	100
T	100	0	0	0	0	0	0
H	7.5	24.5	15.1	15.1	13.2	24.5	100
C	0	18.2	9.1	27.3	9.1	36.4	100
F	0	0	25	0	50	25	100
D	8.3	16.7	8.3	8.3	25	33.3	100
M	7.1	14.3	7.1	14.3	21.4	35.7	100

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****

TABLE 24 ... HOUR OF ACCIDENT BY CAUSE

	0-	5-	10-	15-	20-	TOTAL
S	3	1	12	5	0	21
T	1	0	0	0	0	1
H	4	7	26	9	7	53
C	1	0	5	4	1	11
F	0	0	1	2	1	4
D	1	4	6	1	0	12
M	0	1	5	7	1	14
	10	13	55	28	10	116

... HOUR OF ACCIDENT BY CAUSE (%'S)

	0-	5-	10-	15-	20-	TOTAL
S	14.3	4.8	57.1	23.8	0	100
T	100	0	0	0	0	0
H	7.5	13.2	49.1	17	13.2	100
C	9.1	0	45.5	36.4	9.1	100
F	0	0	25	50	25	100
D	8.3	33.3	50	8.3	0	100
M	0	7.1	35.7	50	7.1	100

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SURVEY OF INDUSTRIAL ACCIDENTS

TABLE 25 ... YEAR COMMISSIONED BY EQUIPMENT TYPE - NUMBER SERVICES

	BEFORE 1977	77	78	79	80	81	82	83	84	85	86	TOTAL
CRANES .. CONTAINER	0	0	0	0	0	0	0	0	0	0	0	0
P.E. TRAVELLING	34	10	0	0	0	0	0	0	1	0	0	45
P.E. FIXED	1	0	0	0	0	0	0	0	0	0	0	1
E.O. TRAVELLING	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE	6	2	0	0	0	3	0	0	0	0	0	11
FLOATING	0	0	0	0	0	0	0	0	0	0	0	0
UNDERHUNG JIB	0	0	0	0	0	0	0	0	0	0	0	0
O/H BELT CONVEYOR	0	0	0	0	0	0	0	0	0	0	0	0
TRACTOR	69	0	34	0	7	33	18	0	0	0	0	161
TRAILER	0	0	0	0	0	3	0	0	0	0	0	3
FORKLIFT TRUCK	51	0	0	116	0	6	78	4	7	1	0	263
	161	12	34	116	7	45	96	4	8	1	0	484

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SURVEY OF INDUSTRIAL ACCIDENTS

TABLE 26 ... YEAR COMMISSIONED BY EQUIPMENT TYPE - NUMBER INSPECTIONS

	BEFORE 1977	77	78	79	80	81	82	83	84	85	86	TOTAL
CRANES .. CONTAINER	0	0	0	0	0	0	0	13	3	0	0	16
P.E. TRAVELLING	52	20	0	0	0	0	0	0	1	0	0	73
P.E. FIXED	7	1	0	0	0	0	0	0	0	0	0	8
E.O. TRAVELLING	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE	18	3	4	0	0	13	0	0	0	1	0	39
FLOATING	5	0	0	0	0	0	0	0	0	0	0	5
UNDERHUNG JIB	22	0	0	0	0	0	0	0	0	0	0	22
O/H BELT CONVEYOR	0	0	0	0	0	0	0	0	0	0	0	0
TRACTOR	0	0	0	0	0	0	0	0	0	0	0	0
TRAILER	0	0	0	0	0	0	0	0	0	0	0	0
FORKLIFT TRUCK	0	0	0	0	0	0	0	0	0	0	0	0
	104	24	4	0	0	13	0	13	4	1	0	163

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SURVEY OF INDUSTRIAL ACCIDENTS

TABLE 27 ... YEAR COMMISSIONED BY EQUIPMENT TYPE - NUMBER REPAIRS

	BEFORE 1977	77	78	79	80	81	82	83	84	85	86	TOTAL
CRANES .. CONTAINER	0	0	0	0	0	0	0	0	0	0	0	0
P.E. TRAVELLING	0	0	0	0	0	0	0	0	0	0	0	0
P.E. FIXED	0	0	0	0	0	0	0	0	0	0	0	0
E.O. TRAVELLING	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE	0	0	0	0	0	0	0	0	0	0	0	0
FLOATING	0	0	0	0	0	0	0	0	0	0	0	0
UNDERHUNG JIB	0	0	0	0	0	0	0	0	0	0	0	0
O/H BELT CONVEYOR	0	0	0	0	0	0	0	0	0	0	0	0
TRACTOR	559	0	94	0	86	271	112	0	0	6	0	1128
TRAILER	0	0	0	0	0	25	0	0	0	0	0	25
FORKLIFT TRUCK	724	0	0	604	0	35	339	11	87	6	0	1806
	1283	0	94	604	86	331	451	11	87	12	0	2959

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SURVEY OF INDUSTRIAL ACCIDENTS

TABLE 28 ... % TYPE OF CONTROL BY EQUIPMENT TYPE

	NUMBER	LEVER	S/W	CLUTCH	HANDLE	J/STICK	BRAKE	OTHER
CRANES .. CONTAINER	8	37.5	0	0	25	62.5	100	12.5
P.E. TRAVELLING	24	45.8	0	0	66.6	8.3	91.6	33.3
P.E. FIXED	3	100	0	0	100	33.3	66.6	0
E.O. TRAVELLING	0	0	0	0	0	0	0	0
MOBILE	16	62.5	50	56.2	56.2	37.5	93.7	25
FLOATING	1	100	0	100	100	0	100	100
UNDERHUNG JIB	6	33.3	0	0	66.6	16.6	100	0
O/H BELT CONVEYOR	0	0	0	0	0	0	0	0
TRACTOR	42	71.4	95.2	35.7	35.7	2.3	97.6	2.3
TRAILER	1	100	100	0	0	0	100	0
FORKLIFT TRUCK	56	91	94.6	28.5	42.8	0	94.6	0

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TABLE 29... TYPE OF SAFETY DEVICE BY EQUIPMENT TYPE

	NUMBER	O/W/S	O/L/S	T/L	L/T/L	L/T	L/R/I	RSLI	V/I	S/I	O/L/P	A/B	L/T	OTHER
CRANES .. CONTAINER	8	100	75	75	25	50	25	87.5	75	50	50	100	62.5	87.5
P.E. TRAVELLING	24	66.6	8.3	0	4.1	29.1	58.3	62.5	37.5	58.3	16.6	83.3	0	12.5
P.E. FIXED	3	66.6	0	0	0	0	33.3	33.3	0	33.3	0	66.6	0	0
S.O. TRAVELLING	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE	16	37.5	0	0	0	37.5	56.2	68.7	56.2	62.5	12.5	12.5	0	37.5
FLOATING	1	0	0	0	0	0	0	0	0	0	0	0	0	0
UNDERHUNG JIB	6	33.3	16.6	33.3	16.6	0	0	33.3	16.6	33.3	16.6	83.3	0	16.6
O/H BELT CONVEYOR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRACTOR	42	0	0	0	0	0	0	0	0	0	0	2.3	0	4.7
TRAILER	1	0	0	0	0	0	0	0	0	0	0	0	0	0
FORKLIFT TRUCK	56	14.2	1.7	1.7	0	18.7	0	1.7	0	1.7	1.7	3.5	0	1.7

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SURVEY OF INDUSTRIAL ACCIDENTS

TABLE 30 ... % OF EQUIPMENT WITH CONTROLS OR SAFETY DEVICES

EQUIPMENT TYPE	NUMBER MACHINES	% WITH CONTROLS	% WITH SAFETY DEVICES
CRANES .. CONTAINER	8	100	100
P.E. TRAVELLING	24	91.7	87.5
P.E. FIXED	3	100	100
E.O. TRAVELLING	0	0	0
MOBILE	16	93.7	75
FLOATING	1	100	0
UNDERHUNG JIB	6	100	83.3
O/H BELT CONVEYOR	0	0	0
TRACTOR	42	97.6	4.8
TRAILER	1	100	0
FORKLIFT TRUCK	56	94.6	26.8
	157		

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TABLE 31... UTILISATION OF MANUALS BY EQUIPMENT TYPE

	NUMBER	PROVIDED	EXPLAINED	AVAILABLE
CRANES .. CONTAINER	8	75	75	75
P.E. TRAVELLING	24	16.6	16.6	8.3
P.E. FIXED	3	33.3	33.3	0
E.O. TRAVELLING	0	0	0	0
MOBILE	16	18.7	18.7	12.5
FLOATING	1	0	0	0
UNDERSLUNG JIB	6	16.6	16.6	16.6
O/H BELT CONVEYOR	0	0	0	0
TRACTOR	42	9.5	9.5	4.7
TRAILER	1	0	0	0
FORKLIFT TRUCK	56	19.6	19.6	14.2

Reference:

1. An introduction to port working by National Dock Labour Board, U.K.

2. Annual Bulletin of Port statistics issue 1985, a.o. by KPA, port of Mombasa, Kenya.

3. Bandari College Curriculum for 1987/88 (unpublished) by Principal, Bandari College, port of Mombasa, Kenya.

4. Code of Practice for the Examination and Testing of Ships' Derrick Part II, by C.T.A. 1968.

5. Convention and Recommendation concerning Occupational Safety and health in Dock work by I.L.O. 1979.

6. General Safety Rules by KCHS, port of Mombasa, Kenya.

7. Guide book for the training of slingers by Foundry Industry, U.K.

8. Maintenance service container gantry crane manual by Caillard Leverage, France.

9. Operating Instructions by Jones Cranes and Coles Cranes Ltd., England.

10. Operating and maintenance crane manual by Canrod Ltd., Canada.

11. Routine Maintenance, Electric Forklifts manual by Climax Parts and Service Ltd., England.

12. Service Instructions by Kone, Finland.

13. The Docks Rules 1962 by Republic of Kenya, L.N.306.

14. The Dock Workers Employment Scheme by National Dock Labour Board, U.K. 1967.

15. The Kenya Ports Authority Act 1978 (revised 1979), Statutary - Law, Laws of Kenya.

16. The Port of Liverpool and Birkenhead Docks by Mc Corquodale and Co., U.K.

17. Wire ropes by British Rope Ltd., U.K.

Note: Reference, for technical information, to some chapters in Electric Cranes by H. H. Broughton 1958.