BACHELOR THESIS – ME141502

WEB BASED MAINTENANCE AS DECISION SUPPORT FOR PREVENTIVE MAINTENANCE

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DOUBLE DEGREE PROGRAM
MARINE ENGINEERING DEPARTEMENT
FACULTY OF MARINE TECHNOLOGY
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SURABAYA

TUGAS AKHIR – ME141502

PERAWATAN BERBASIS WEB SEBAGAI PENDUKUNG KEPUTUSAN UNTUK PERAWATAN PREVENTIF

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PROGRAM DOUBLE DEGREE
JURUSAN TEKNIK SISTEM PERKAPALAN
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APPROVAL FORM

WEB BASED MAINTENANCE AS DECISION SUPPORT FOR PREVENTIVE MAINTENANCE

FINAL PROJECT

Submitted to Fulfill One of The Requirement
to Obtain a Bachelor Engineering Degree on Reliability,
Availability, Maintainability and Safety (RAMS) Laboratory
S-1 Program Department of Marine Engineering
Faculty of Marine Technology
Institute Technology Sepuluh Nopember

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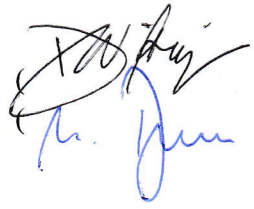

SURABAYA
JULY, 2016

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Approval Form

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Bachelor Engineeting Degree
On
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Institut Teknologi Sepuluh Nopember

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WEB BASED MAINTENANCE AS DECISION SUPPORT FOR PREVENTIVE MAINTENANCE

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ABSTRACT

Web based or computer based system can help the implementation of routine maintenance as well as ship preventive maintenance, it is because of with the web based or computer based system it can make the maintenance work faster and more efficient, because the information stored on database can be accessed easily and the information can be deliver quickly. Web based maintenance can be the solution of the maintenance problem that not efficient and can help on decision making. Web based maintenance can be a guideline to do maintenance, with showing the frequency of maintenance and the maintenance activity instruction each component. Web based maintenance equipped with an access data of work hour each component, so it can be monitored on realtime. This web also equipped with reminder system that combined with voyage plan, work hour of component and maintenance frequency, there is an explanation about the risk possibility when the maintenance cannot be done, with the risk level of each possibility. Beside that there is a printed work order form on the web to execute the maintenance that already approved. All of the information about work hour, maintenance frequency, components, maintenance record, maintenance activity, spare parts, etc, will be stored on the database that already provided before. The security of the web equipped with login page that filtered the user, so the web can be

accessed by authorized person only. Web based maintenance expected to increase the maintenance performance in order to faster, more efficient and more simple. Beside that it can help decision making to do the maintenance.

Keywords: web, maintenance, web based maintenance, decision making, database.

PERAWATAN BERBASIS WEB SEBAGAI PENDUKUNG KEPUTUSAN UNTUK PERAWATAN PREVENTIF

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ABSTRAK

Sistem berbasis web ataupun komputer dapat membantu pelaksanaan perawatan rutin maupun perawatan preventif kapal, hal ini dikarenakan dengan mengunakan sistem berbasis web ataupun komputer dapat mempercepat dan mengefisiensikan pekerjaan perawatan, sebab informasi yang disimpan dalam database dapat dengan mudah diakses dan juga informasinya dapat dengan cepat dikirimkan. Perawatan berbasis web dapat menjadi solusi permasalahan perawatan yang tidak efisien serta dapat membantu dalam pengambilan keputusan. Perawatan berbasis web menjadi petunjuk dalam pelaksanaan perawatan dengan menampilkan frekuensi perawatan setiap komponen, serta instruksi aktifitas perawatan setiap komponen. Perawatan berbasis web ini juga dilengkapi dengan akses data jam kerja komponen secara realtime, sehingga komponen dapat dipantau secara realtime. Web ini juga menyediakan sistem pengingat perawatan yang dipadukan dengan rencana perjalan kapal dan jam kerja komponen serta frekuensi perawatan, terdapat pula penjelasan kemungkinan risiko yang dapat terjadi jika perawatan tidak dilakukan, dengan disertai tingkatan risikonya. Selain itu juga terdapat pencetakan work order untuk pengeksekusian aktifitas perawatan yang telah disetujui. Serta informasi mengenai jam kerja, frekuensi perawatan, komponen – komponen, rekam perawatan, aktifitas perawatan, suku cadang

komponen, dll, akan disimpan dalam database yang telah disediakan. Serta kemanana web yang dilengkapi dengan halaman login yang berfungsi sebagai penyaring penguna, sehingga hanya orang – orang tertentu yang dapat mengakses informasi yang tersedia dalam web ini. Dengan perawatan berbasis web ini diharapkan dapat meningkatkan kinerja perawatan agar lebih cepat, lebih efisien dan lebih praktis. Serta dapat membantu dalam pengambilan keputusan dalam melakukan perawatan.

Kata kunci: web, perawatan, perawatan berbasis web, pengambilan keputusan, database.

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CHAPTER I
INTRODUCTION

1.1. Background

PT. Tanto Intim Line is one of the biggest shipping company in Indonesia, with all of the fleet or ship that the company has and all of the different route, the real time information about the condition of all the components. The information that is given by the on-board crew will be used to make some planning about how and when the maintenance will be held. The maintenance process used to prevent failure of the components or system when the ship is sailing, so there is no disturbance when the ship is operating to transport their cargo. The main asset of shipping company is their ship, without their ships the business chain of shipping company will be useless. The ship operated by the propulsion system, with the propulsion system the ship can do the voyage or transport the cargo of its customer, so one of the important components of the ship it's the propulsion system of the ship.

Maintenance is one of the ways to keep the availability of the asset, so there is no disturbance in the function of its asset. With maintenance the availability of the asset will increase, prevent the failure of the component, reduce the cost of repairing because maintenance reduces the impact of component failure. Therefore, the maintenance process or procedure is one of important task for the company, so the company can provide better service for the consumer, with less downtime or problem.

An efficient, planned and controlled maintenance could be executed properly, with the maintenance management that used by the companies provide better data archives system. But there are still some companies that do the transferring data or information using conventional paper process. The risk of human factor in the conventional paper process compared with information

system is higher than the information system. Therefore, shipping companies require an information system to support the storing, transferring and searching data faster and more efficient. The information system will need a database to store all of the information that require to support the maintenance management.

Management information system will be the solution to these challenges. It will manage all of the periodical maintenance and routine maintenance more effective. The faster, efficient and accurate to acquire the information in real time, it can help the decision maker to make more accurate decision making in terms of ship maintenance.

1.2. Statement of Problems

The right or the effective maintenance strategy, especially preventive maintenance is really needed to set the optimal maintenance schedule, so the ship can operate without any disturbance and the reliability of the ship always on the good condition. On the other side the ship owner want to save some money so they didn't do the right maintenance process, but the cost of the repairing for the failure component might be spend more money than to do the right maintenance. To make some maintenance schedule, we need to know the real time condition of the ship, and some previous data about the failure of each component. Based on the description above, could be concluded some problem on this final project, there are:

a. How to do appropriate ship maintenance schedule?
b. How to design decision support system for preventive maintenance.

1.3. Research Limitation

Problem limitation on this final project are:

a. This research only does on critical component that could disturb operational of the ship.
b. This research based on the data that given by PT. Tanto Intim Line

c. Not all the specific component will be examining in this research.
d. The design of decision support system for preventive maintenance will be using Macromedia Dreamweaver for web interface, and MySQL for the database.

1.4. Research Objectives

Based on problem above, the objective of this final project are:

a. Give the recommendation to do the preventive maintenance for the criticality equipment.
b. Design web based maintenance as decision support system for preventive maintenance.

1.5. Research Benefits

This final project is expected to give benefits for the various kind of parties. The benefits that can be obtained are:

a. To help the shipping company to apply preventive maintenance, so the availability of the shipping company asset is increasing.
b. With the decision support system for preventive maintenance, it can help the company in the maintenance management process and the decision maker for the maintenance activity

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CHAPTER II
LITERATURE STUDY

2.1. Management Information System

A management information system is an information system that provides output to a manager. The term 'manager' refers to decision-makers in organizations only, which is admittedly a somewhat narrow view of the concept. (Heijden, 2009). A management information system normally used to manage all of the information to support the manager of the organization to make decision making, therefore a management information can help a lot with the decision making, because all of the information will be managed and stored in management information system, so it make easier to decision maker to make a decision based on the stored information.

2.1.1. Scope of Management Information System

The scope of management information system is from can be seen on figure below.

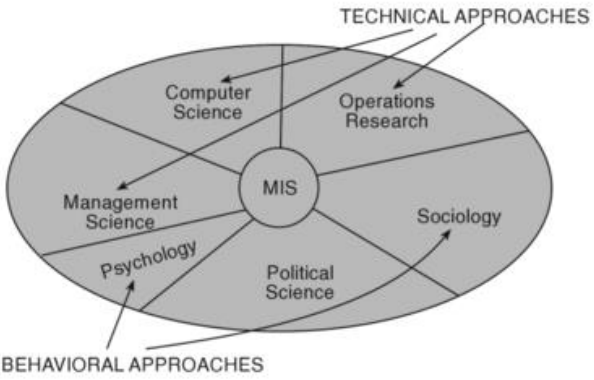

Figure 2.1. Scope of Management Information System (source: Gupta, Hitesh. 2011. Management Information System (An Insight). International Book House PVT. Ltd., New Delhi.)

The scope of management information system as shown on the figure above, the management information system not only cover technical approaches but behavioral approaches too. So the management information system can be used for all aspect as long as the characteristic of management information system can be met to create or to design management information system. The connection between Management Information System and the Organization to help decision making on the organization, can be seen on figure below.

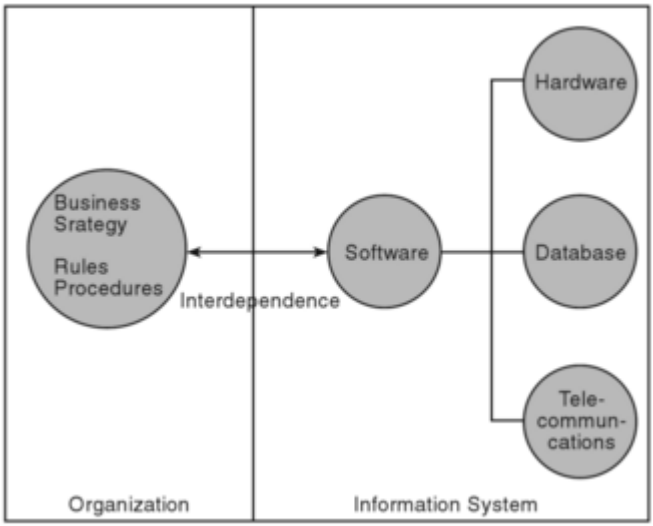

Figure 2.2. Connection between organization and information system (source: Gupta, Hitesh. 2011. Management Information System (An Insight). International Book House PVT. Ltd., New Delhi.)

The connection between the organization and information system is crucial, because information system provides information to help organization make some decision to improve the organization itself or to do an action with regard to the information that already exist.

2.1.2. Management Information Objective

The main objective of management information system to facilitate the decisions-making process by furnishing information in the proper time frame. This helps the decision-maker to select the best course of action. Beside that the objective of management information system to provide a system of people, computers, procedures, interactive query facilities, documents for collecting, storing, retrieving and transmitting information to the users.

2.1.3. Management Information Function

Management information system can support a structured decision that has been defined previously, to support the decision with structured or defined any of the procedures, management information systems cannot provide a real solution. Basically, the decision can be divided into two, (Scott, 1996)

1. Structured decisions have clear rules that can be programmed. The required information is clear and usually less. These decisions are often made. Apply to small scale and short term.
2. Unstructured decision has no clear ruins so that not being programmed. The information required is not certain, due to lack of structure and could he due to lack of understanding the real issues.

2.1.4. Basic Component of Information System

The basic component of information system consists of several components, such as input data, data processing, develop procedure, and preparing output. (Scott, 1966) The basic component can be shown as the figure below.

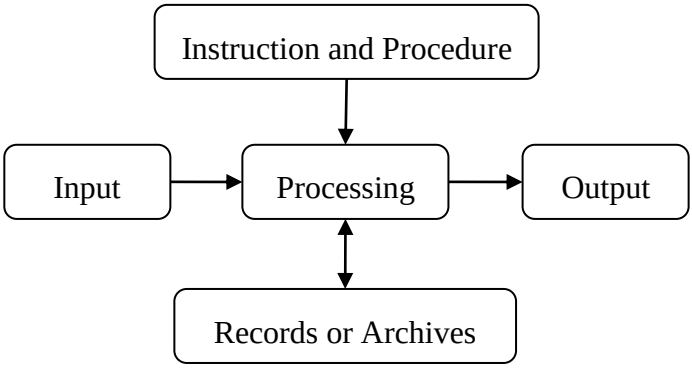

Figure 2.3. Basic Concept of Information System (source: Scott, George M. 1986. Principles of Management Information System. McGraw Hill.)

The basic component of information system design of how the information system works. Manually all of the component will be done by human being, but with the technology now on the component can be done using computer. Human only need to input the information and make some logical function so the computer can process information to make some output just like the develop expected. The computer can be used to process the information faster and much more then human being. Because human brain has a limitation to process all of the calculation or all of logical function, therefore computer can help human to accomplish their task with calculation or do the logical function.

2.2. Management Support System

When information system applications focus on providing information and support for effective decision making by managers, they are called management support systems. Providing information and support for decision making by all types of managers and business professionals is a complex task. Conceptually, several major types of information systems support a variety of decision-making responsibilities: (1) management

information systems, (2) decision support systems, and (3) executive information systems. (Gupta, 2011).

Management Support System is a combination between Management information system and Decision support system, so with the help of management information system the system can make a decision making like decision support system. The information that collected form management support system will be used to make some decision to help the user make a decision.

2.3. Maintenance

Maintenance is a maintenance activity accordance to the procedure by looking at the probability of a component or system damage or failure. (Ebeling, 1997). *Preventive maintenance* is a simple maintenance activity such as repairing, changing the component, setting the machinery, lubricating and other maintenance activity at the downtime schedule that already measured by analyzing the failure rate of the machine. (Ebeling, 1997). The preventive maintenance reduces the amount of reactive maintenance to a low level enough that the other initiatives in the asset management process.

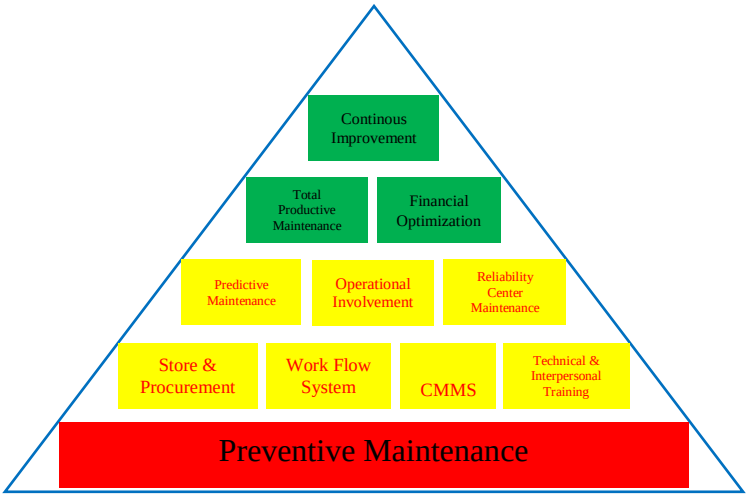

Figure 2.4. Maintenance Management Pyramid (source: Wireman, Terry. 2003. Benchmarking Best Practice in Maintenance Management. Industrial Press Inc., New York.)

Figure 2.4 shows us about maintenance management pyramid from the book of "Benchmarking Best Practice in Maintenance Management by Terry Wireman". To build or develop the best maintenance management there are several aspects that must fulfill before do the other aspect, the lower aspect indicates the basic maintenance system and the higher aspect indicate more advanced maintenance system. So before we develop complex maintenance system the first thing to do is do the preventive maintenance. Because without preventive maintenance, the complex maintenance system can't be done. Therefore, preventive maintenance need to be done and do the right maintenance execution before do the other part of maintenance system.

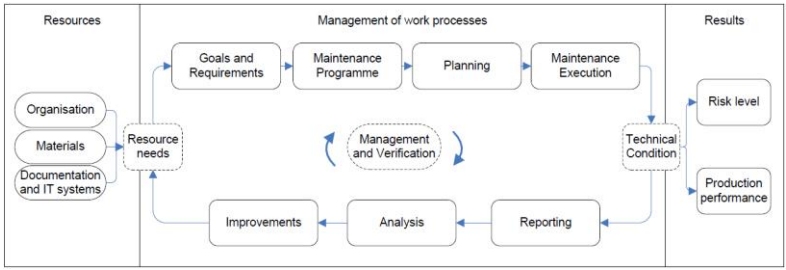

Figure 2.5. Maintenance management process (source: NORSOK STANDARD Z-008)

Flowchart on figure 2.5 show us about the basic maintenance management process from NORSOK STANDARD Z-008. In the flowchart above the management of work process begin on resource needs, the component or the system information included in resource needs, the information will be used for the maintenance programme. In maintenance programme, we need to identify failure cause, failure pattern or failure mode, maintenance programme includes maintenance interval and written procedures for maintaining, testing and preparing the various component. A maintenance plan is structured by activity, procedure, and method. All of the plan basically needs to consider based on the impact on production and HSE (healthy, safety and environment). Then the maintenance execution, maintenance execution as general is about giving work order according to the maintenance plan. The execution includes preparation, work permits, carrying out work and reporting mandatory information on work order. After the work order is done, the work order need to be reported so the work order is closed if the work order done perfectly just as planned, and the reporting of work order will be used for analyzing to make some improvement for maintenance process if it's needed.

2.4. Generic Maintenance Concept

The Generic Maintenance Concept is a set of maintenance actions, strategies and maintenance details, which

demonstrates a cost efficient maintenance method for a defined generic group of equipment functioning under similar frame and operating conditions, the use of the GMC should ensure that all defined HSE (Healthy, Safety, Environment), production, cost and other operating requirements are met. (NORSOK STANDARD Z-008). For several components or several equipment there is the Generic Maintenance Concept that has already developed by the company or manufacturer.

2.5. Equipment List

For the equipment that need to be maintained by the ship, classification society already has a list about what the important equipment that need to be maintained. From the Germanischer Lloyd Classification renewal survey section there are several items that need to be considered.

Machinery including electrical installation
Propulsion system
Inspections of the propulsion system are to mainly cover:
• intermediate shafts and bearings, including thrust bearings
• gearing
• mechanical and flexible couplings
• turning gear, and
• the main propulsion engines,

Spring elements made of rubber – with or without plies of fabric – of rubber ring clutches with or without plies of fabric and under shear load, and other rubber or fiber reinforced, couplings, are to be renewed, if required on account of negative inspection results.

Main propulsion engines
The components listed below are to be inspected and, where deemed necessary by the Surveyor, checked in dismantled condition:
• cylinders, cylinder covers, pistons, piston rods and bolts, cross

heads, crankshaft and all bearings
• camshaft, with drive and bearings
• tie rods, frame, and foundation and fastening elements
• injection system, attached pumps and compressors, superchargers, suction and exhaust lines, charging air coolers, filters, monitoring, control, protective and safety devices, starting, reversing and manoeuvring equipment

Auxiliary engines
For all essential auxiliary engines, the survey scope is identical to that applying to main engines. A reduction in the scope of survey may be agreed to upon examination of the maintenance protocols.
Auxiliary machinery, equipment and piping
The following machinery components are, if deemed necessary by the Surveyor, to be inspected and tested in the dismantled condition:
• all pumps of the essential systems
• air compressors, including safety devices
• separators, filters and valves
• coolers, pre-heaters,
• main and auxiliary steering gear
• anchor and other windlasses, including their drives
• piping, pipe connections, compensators and hoses
• emergency drain valves and bilge piping systems
• tank filling level indicators
• installations preventing the ingress of water into open spaces
• freshwater distillation plant
• oil purifier and sewage systems and
• additional systems and components, where deemed necessary by the Surveyor

2.6. Main Engine Support System

Main engine need support system to operate without any trouble and each component of the engine itself need maintenance to maintain the condition of each component so the main engine

can operate without any trouble. There are 3 main systems to support the main engine, there are:

1. Lubricant System
   The internal combustion engine can't work if there is no lubricant on the moving parts, because without lubricant the parts will do the friction of the other parts. Because of the friction of each part it can create heat and if the heat caused by the friction is too high, it can make the parts will be melted and the engine will be destroyed or maybe will cause explosion from the engine itself. Therefore, all of the moving parts need lubricant oil to prevent direct friction to each part, beside to prevent direct friction to each part, lubricant oil used to protect parts from the worn-out of the component, to absorb heat from the friction. To ensure all of the parts coated with lubricant oil, so the maintenance of lubricant system needs to be done correctly.
2. Fuel System.
   All of the diesel engines need to store and to deliver fuel to the engine. For the diesel engine fuel injector is an important component, because the injector is an extremely precision component with very strict tolerance, the delivered fuel must be as clean as possible without any contamination from the obstacle. To make sure there is no obstacle on the fuel there are some filter in the fuel system, the placement of the filter itself usually outside the engine, after the fuel pass through the first filter there are another filter inside of the engine, to make sure the fuel as clean as possible so the combustion process will work without any trouble. If there is any obstacle that pass through the filter it can block the injector nozzle, because as we know the injector nozzle is very small, so if there are any small particle that pass through the filter it can block the injector nozzle and if it happens the delivered fuel will be disturbed.

3. Cooling System
   For the cooling system of diesel engine generally use liquid cooling system to transfer the heat from each block and from the engine. The cooling system use a close loop system. To keep the engine on the right temperature cooling system, need to work perfectly, because if there are any problem with cooling system automatically temperature of the engine will be increased, if the overheat happens on the main engine it can destroy the main engine itself because the component can't handle the high temperature.

2.7. Risk Assessment

Risk assessment is the process of evaluating the risk that comes from the potential hazard that may have a detrimental impact on the safety aspect. The result of risk assessment is a risk rating that comes from the risk matrix of likelihood level and consequence level. The level of likelihood, consequence level and risk matrix will be determined using Australian Standard 31000:2009, that shown in Table 2.1, Table 2.2 and Table 2.3.

Table 2.1. Likelihood Table

Category	Explanation
Almost Certain	Expected to occur in most circumstances, or often in the life of a vessel's operation.
Likely	Probably occur in most circumstances, but unlikely to occur often in the life of a vessel's operation.
Possible	Might occur at some time, unlikely to occur to every vessel but may occur to a few vessels of a particular type.
Unlikely	Unlikely to occur but should be considered as possible.
Rare	So extremely remote that it should not be considered as possible unless exceptional circumstances exist.

Table 2.2. Severity Level

Category	Human Injury	Financial Cost	Work / Income / Reputation	Environment
Catastrophe	Multiple fatalities.	Loss of vessel, total loss of income.	Operations halted, image / reputation is severely damaged.	Extensive environmental damage.
Major	Fatality.	Extensive financial loss.	Major disruption to operations, temporary loss of income, image / reputation impacted.	Major environmental damage.
Possible	Disabling injury requires medical treatment.	Significant financial loss.	Significant disruption to operations, image / reputation suffers.	Significant environmental damage.
Minor	First aid treatment for minor cuts, bruises or abrasion.	Notable financial loss.	Minor disruption to operations.	Minor environmental damage.
Insignificant	No injuries.	Negligible financial loss.	No adverse effect on operations.	Negligible environmental damage.

Table 2.3. Risk Matrix

Ref. ISO 31000:2009	Consequence				
Likelihood	Insignificant	Minor	Possible	Major	Catastrophe
Almost Certain	Moderate	High	Extreme	Extreme	Extreme
Likely	Moderate	High	High	Extreme	Extreme
Possible	Low	Moderate	High	Extreme	Extreme
Unlikely	Low	Low	Moderate	High	Extreme
Rare	Low	Low	Moderate	Moderate	High

2.8. Web Development

Web is an interactive communication that used on a computer network. With web the communication from one computer to another computer can be connected as fast as possible. There are 2 types of web, the first one is web based or web application, if the end user interaction with the web via a web browser without any database required it called web application or web based. The other type of web is a Web database application this type is a web application that require a long term information storage for databases. Basically Web database application is designed to help a user to accomplish some task.

Web Database Application consist of database and application. A database is a long term memory of the web database application, therefore the application itself can't fulfill its purpose if there is no database. Application is the program or a group of program that perform the tasks. The program creates the display that the user can see from the web browser windows, beside that the program accepting and processing the information that user type or input on the web browser, and then the information stored in the database.

The flow of the information in and out from the database shown in figure 2.6 explain that, the user input their information or request information form the web page, then the information will be transferred to the web server that connect database and web page. On this process PHP will do the job to process the

information of the database, when HTML do the job on web interface so the user can see the display of application of the web.

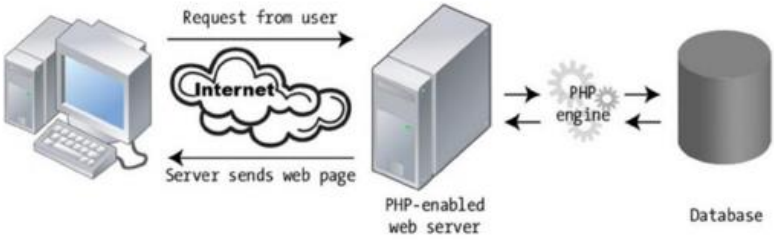

Figure 2.6. Connection from web to database (source: Powers, David. 2014. PHP Solutions: Dynamic Web Design Made Easy Third Edition. Apress.)

2.7.1. Macromedia Dreamweaver 8

Macromedia dreamweaver 8 is a tool for developing a web and pages. Macromedia Dreamweaver is a visual editor that enables to edit pages in an interface way. So Macromedia dreamweaver 8 not only to edit the pages using the code, but it can edit pages using an interface way. Macromedia Dreamweaver 8 usually used to make a web page not only using one type of language but it supports with another language. The language that supported by Macromedia dreamweaver 8 such as PHP, HTML, XHTML, etc. So with Macromedia dreamweaver 8 it's possible to create web pages that connected to the web database. The work page of Macromedia Dreamweaver 8 shown on Figure 2.7.

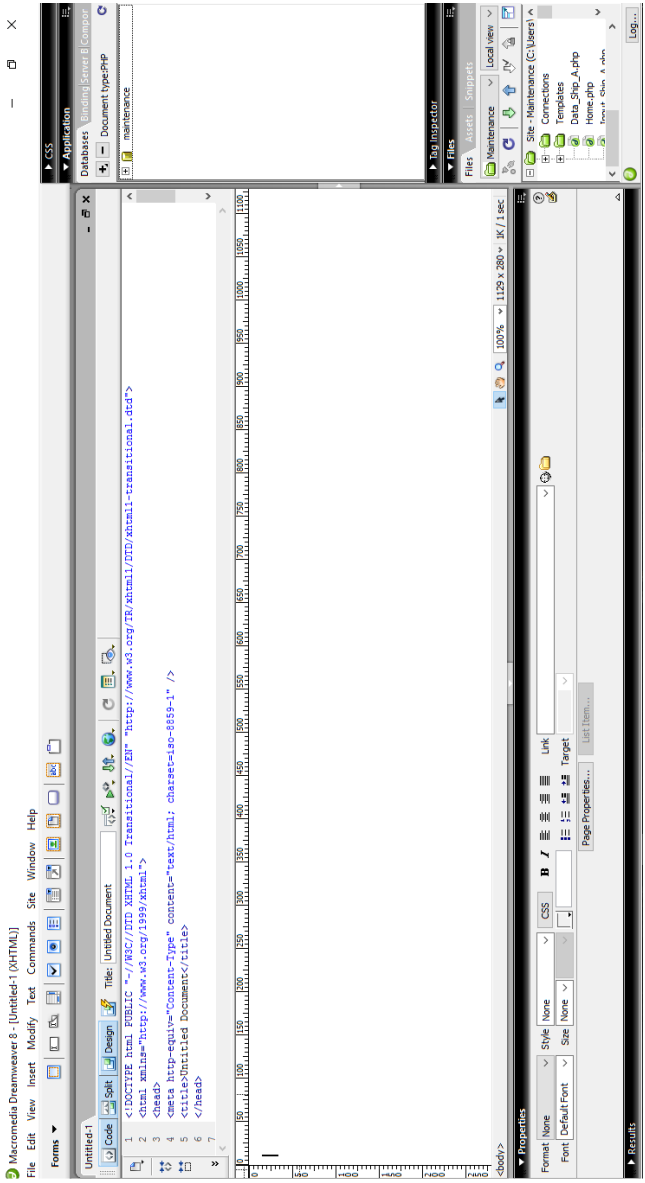

Figure 2.7. Macromedia Dreamweaver 8 Work Page

2.7.2. PHP (Hypertext Preprocessor)

PHP (Hypertext Preprocessor) is a programming language that used to develop a web that can make a web more dynamic, because with only HTML (Hypertext Markup Language) the web will be static web. The reason PHP make a web more dynamic is PHP was originally designed to embedded in the HTML of a webpage and that's the way it's often still used (Power, 2014). So with PHP web pages can be connected to web server to view or to collect some information from the database that need to be shown on webpages, for the example PHP can show a current time or date on web pages because of it connected to the web server. Beside that PHP can be used to connect database with web pages.

2.7.3. MySQL

SQL is, above all else, a computer language used to manage and interact with data in a relational database. SQL is the most universally implemented database language in use, and it has become the standard language for database management. SQL works in conjunction with a RDBMS to define the structure of the database, store data in that database, manipulate the data, retrieve the data, control access to the data, and ensure the integrity of the data. Although other languages have been developed to implement the relational model, SQL has emerged as the clear winner. (Sheldon & Moes, 2005)

To store all of the data from web pages, MySQL has a role to manage all of the data that needed to be stored in the database. To manage all of the data MySQL manage it with making data to a table. So the data that store in database can be managed and make it easier to be called or to be searched. The structure of database use table and column to manage the database, the structure can be shown on figure 2.8.

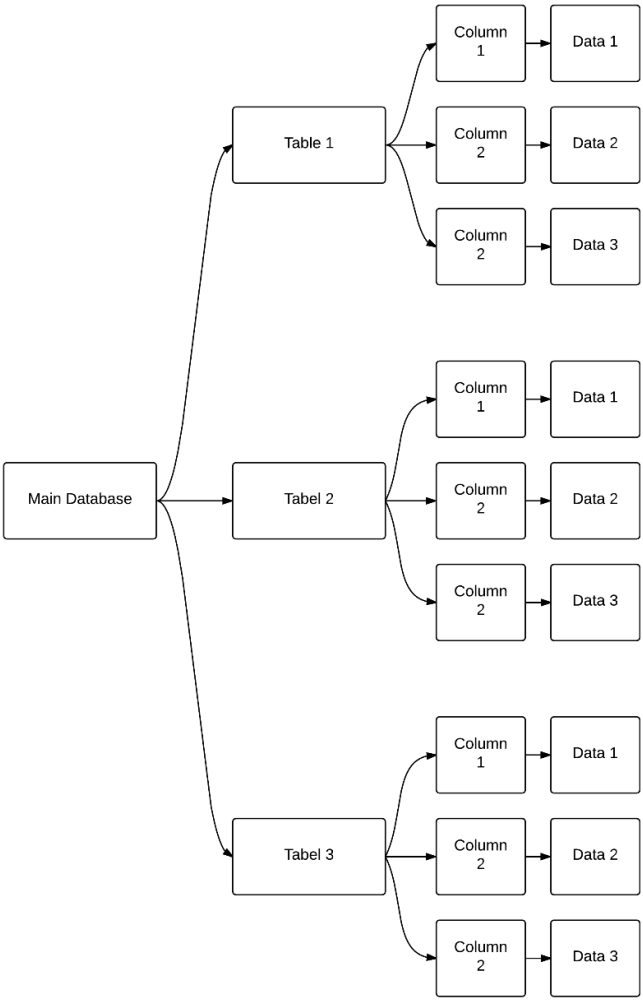

Figure 2.8. MySQL Database Structure

2.7.4. PHP MyAdmin

PhpMyAdmin offers features that cover basic MySQL database and table operations. It also has an internal system that

maintains metadata to support advanced features. Finally, system administrators can manage users and privileges from phpMyAdmin. It is important to note that phpMyAdmin's choice of available operations depends on the rights the user has on a specific MySQL server. (Delisle, 2012).

Basically MySQL didn’t have a display so to access it need to use SQL Programming language, but with PHP MyAdmin the data that stored in the database can be displayed without using SQL programming language to open it. PHP MyAdmin can control all of the data that in and out, make it connected with each column to column. PHPMyAdmin interface shown on the figure 2.9.

Figure 2.9. PHP MyAdmin Interface

2.9. Maintenance Management Software

There is several maintenance management software that already exists and well known among the companies. Each maintenance management software offers the different features of its software. The features of existing maintenance management software will be presented below.

2.9.1. DNV GL Technical Ship Management

The features from DNV GL Software

- centrally manage your fleet wide equipment and maintenance jobs
- define and schedule counter-/calendar-based and condition-based tasks
- categorize jobs and elements according to relevant criteria, such as critical, safety relevant, class relevant or origin
- prepare and document all planned and unplanned maintenance tasks performed
- automatically update stock counts in consideration of spare parts consumed for maintenance tasks
- keep running hours for each equipment item individually, regardless of where it is installed
- define different manual and automatic counters and counting directions
- attach digital forms, manufacturer’s instructions, illustrations and integrated measurement records

2.9.1. CWorks CMMS

The features from CMMS Software:

Table 2.4. CMMS features (source: http://www.cworks.com.my/features.asp)

No	Modules	Function
1	Master	• Provides the coordination of the information. • Define background information which will be used by other modules.
2	Asset	• Provides the facility to record and manage your organization's asset and equipment.
3	Location	• Provides the facility to record and manage your facility's physical location.
4	Work Order	• Provides the ability to view and manage all maintenance activity.
5	Preventive	• Preventive maintenance (PM) master and schedule specifies the work to be performed based on the elapsed time interval.

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CHAPTER III
METHODOLOGY

Methodology represents of the basic framework from stages to finish the final project. The methodology of this final project cover all of the activity that supports the completion of this final project. The activity of this final project used to solve the problem that is given in this final project. The description about methodology is described below.

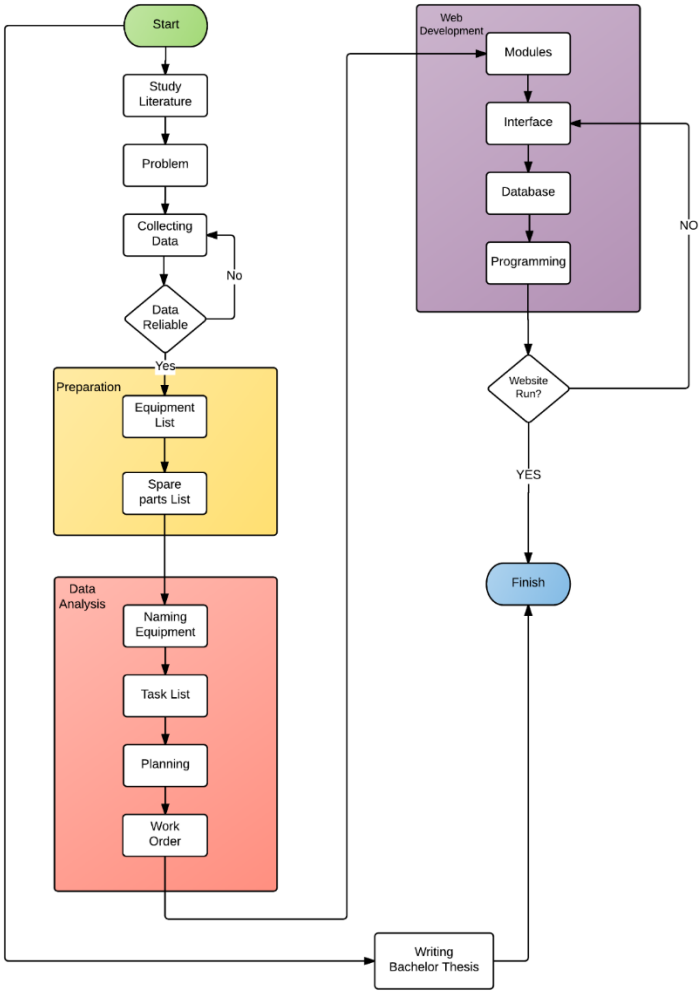


Figure 3.1. Methodology Chart

3.1. Literature Study

The literature study for this final project, all of the information collected from the article, journal, book, and a thesis that has connection about the final project. The main topic of literature study is about maintenance management, web development, management information system. All the information that already collected will be used as basic theory to complete the final project.

3.2. Problem

The problem on the final project can be identified after interviewing chief engineer of the ship and employees of the on land staff. Beside that the problem will be reviewed based on the basic theory about the problem or some article that have the same problem. The interview is about how the maintenance process on the ship and what the most factor that delay the maintenance process.

3.3. Collecting Data

The data is a crucial thing to completing a final project, therefore, to collect the various data that needed to complete the final project, the data collected from the shipping company. These data that needed to complete the final project is about equipment list, planned maintenance schedule, maintenance manual book, maintenance instruction. All of these data needed to create the database for maintenance management and for the decision making to do the maintenance.

3.4. Equipment List

All of the equipment that is given by the shipping company need to be sorted, because not all of the equipment used in this final project. The equipment will be sorted based on Germanischer Lloyd Rules of Renewal Survey on machinery section. So the equipment that's not listed on Germanischer Lloyd Rules of Renewal Survey will not be used in this final project.

3.5. Spare Part List

The spare part list for the ship are acquired from the project guide of main engine and auxiliary engine that listed based on the request from the classification, and the requested quantity of spare parts from the classification. The spare part will be listed for each equipment.

3.6. Naming Equipment

The code name will be given for each equipment to easier recognize each equipment, the code will be given using code format that created before. The code will give the information about the equipment class, system, and the number of equipment.

3.7. Task List

The task list is about giving maintenance activity to each equipment based on work hour of each equipment. The different work hour will do a different maintenance activity. The maintenance activity will be given from maintenance manual book, maintenance, instruction or generic maintenance concept, beside of the maintenance activity, it will give the information about frequency of maintenance activity.

3.8. Planning

After all of the equipment and maintenance activity complete, the maintenance can be planned. The consideration of maintenance planning is work hour, frequent maintenance, and condition of equipment. The voyage of the ship will become the consideration for the maintenance plan. To make maintenance plan all of the considerations will be analyzed using logical functions to decide when the maintenance will be held. Besides that, the risk level of each activity becomes the consideration of the maintenance planning. The risk level of the activity will be created with the risk matrix from Australian Standard 31000:2009.

3.9. Work Order

The maintenance planning will be carried out by work order so the maintenance activity can be held. A work order will be released if there is any maintenance activity that should be done at the exact time of maintenance plan. The standard for creating work order will be using the standard from British Standard EN 13460:2002

3.10. Modules

The essential to create a web is a module of the web and the structure of the web itself, all of the information about maintenance management application such as Germanischer Lloyd Ship Management and CMMS (Computerized Maintenance Management System) will be used as reference for making a module and web structure for the final project, and from the maintenance management process from NORSOK Z-008.

3.11. Web Interface

The realization of web structure is to make web pages as web interface, so the user can access the web. To make web interface the tool is Macromedia Dreamweaver 8 that support PHP, HTML, XTML, etc., to design the web interface. The interface will be using PHP and HTML script that created in Macromedia Dreamweaver 8

3.12. Database

To make the active or live web, the database used to store all of the information that needed to run the web. MySQL is a programming language that manages the information on the web database. PHP MyAdmin is a software to access, change, add, or delete database. The database will be connected to the web interface. To make a good database, it begins with creating data flow diagram, so the relation between one database to another clearly seen. The result of database step will be providing the information that store on back-end of the web, the source of

information is from the interface of the web.

3.13. Programming

The last stage is programming the web, programming the web is the crucial step for the web, because without any program on the web it can't run just as planned. So in programming stages the activity is to connect the database to the web display, so the user can access the information from database on the web pages. The other program is used to create some function to analyze the data, so the data will be analyzed and give the result to the user. The programming will be using Macromedia Dreamweaver 8 as web interface and PHP MyAdmin to access the database. Therefore, the web can run with all of the connection between the web pages and database, so the information from the database can be shown on web pages.

CHAPTER IV
DATA PROCESSING & PROGRAMMING

4.1. General

The collected data for this final project are collected from the shipping company that gave the information about the planned maintenance schedule, maintenance manual book, maintenance instruction book and their equipment list from the ship itself. The collected data of the ship equipment list are about the machinery, the electrical, firefighting and etc. There is a lot of equipment that operate on the ship. So for this final project the equipment will be specified to make fewer list of equipment and more specified. The collected data about maintenance manual book and maintenance instruction manual, it's about the maintenance task or maintenance activity for each equipment in specified time, the different time have a different activity for each equipment.

The data will be stored in the database on the web, so the data can be accessed from the web, to make the decision when the maintenance should be done. Beside that the web maintenance can be a management information system to see all of the information about maintenance of the ship, it can be useful to review the maintenance and to make another decision for the maintenance of the ship.

4.2. Equipment List and Spare Part List

The list of equipment from the collected data will be listed based on Germanischer Lloyd Rules and Regulation section renewal survey on machinery part. The equipment that will be used on this final project only on the ship's machinery part, so the other part beside machinery equipment will not be used in this final project. The machinery part that considered in this final project are main propulsion system and auxiliary engine.

The listed from the equipment will be given the code for each equipment. The function of its code is to give the

information about the equipment so the equipment can be easily recognized by the employee and the worker. The format code for the equipment shown in the formula below,

Nomenclature for system:

AAA – BBB – CCD

Note:

AAA = Group of equipment

BBB = Code of the system

CC = Code of the equipment

D = Number of equipment

Nomenclature for equipment (without system)

AAA – BBC

Note:

AAA = Group of equipment

BB = Code of equipment

C = Number of equipment

The code for all of the equipment can be found on Enclosure 1 (Equipment List).

All of the equipment will be listed based on the critical level from NORSOK STANDARD Z-008, the critical level divided into 3 levels there are high, medium and low. The equipment that will be used for the final project only use the high critical level, because the impact of high level critical equipment

is very huge, the impact of its equipment can cause cessation the main function of the system.

The spare part list for the ship is assumed the ship fulfill all of the spare parts requested by the classification. The spare part listed for each equipment by the requested quantity that need to be ready for the ship. The list of spare parts can be found in Enclosure 2 (Spare Parts list).

4.3. Planning / Reminder System

Planning of maintenance is about when to do the maintenance activity, the consideration to do maintenance are work hour of each component, frequency period of each maintenance activity and ship voyage. The maintenance activity comes from the maintenance manual book or maintenance instruction book that released by the manufacturer of the component. All of the maintenance activity can be shown on Enclosure 3 (Maintenance Activity).

The management of maintenance with a good plan can make maintenance more effective, one of the problem for maintenance activity is the lack of communication between the ship and shipping company about the spare part for the ship equipment, so it could make the maintenance activity will be delayed due to the stock of spare part.

In this final project the planning for maintenance activity will be done on the port while the ship does loading – unloading the cargo as stated by the crew of the ship itself. The maintenance should be done in the port it is to prevent the equipment fail when the ship sailing to the next port. The planning of maintenance will be using “if statement” from the maintenance frequency period, work hour of each component and the next voyage of the ship. The “if statement” for planning the maintenance is shown on the formula below.

If Statement:

$$IF\ (WH > (FM + NV), \text{Normal, Do the Maintenance})$$

Note:
WH = Work hour for each equipment
FM = Frequency period of maintenance for each equipment
NV = Time for the next voyage from the current port to the next port
Normal = The maintenance can be done in the next port
Do maintenance= The maintenance should be done in the current port

The formula above is to decide when the maintenance should be done. So, if the work hour greater than the frequency plus next voyage, the maintenance should be done in the current port, otherwise the maintenance can be done in the next port. For the spare part for the equipment, in this final project it is assumed stored on the shipping company warehouse and some of the equipment stored in the ship itself, so if there are any problem with the spare part stock in the ship, the crew can call the shipping company to deliver the spare part to the ship.

4.3.1. Risk

Beside the voyage plan, the consideration to do the maintenance will be using the risk level of each maintenance activity. To create risk level or risk rating there are a few step:

a. Determine the hazard (what could cause harm?)
b. Determine the risk (what could happen?)
c. Determine the likelihood (how likely is to happen?)
d. Determine the consequences (How bad it will be?)

To determine the risk level will be using the risk matrix, and the consequences in this final project only use the operational consequences. The determination about likelihood and consequences level shown on Table 4.1 and Table 4.2.

Table 4.1. Likelihood Table

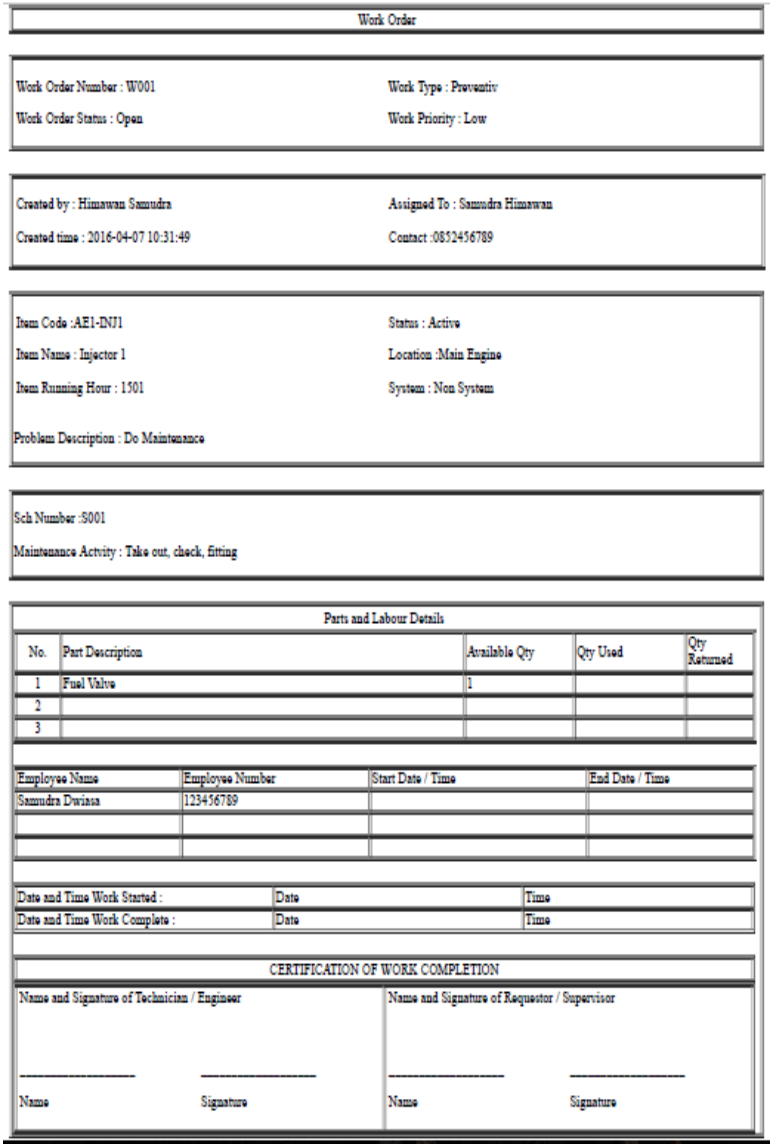
Category	Explanation
Almost Certain	Expected to occur in most circumstances, or often in the life of a vessel's operation.
Likely	Probably occur in most circumstances but unlikely to occur often in the life of a vessel's operation.
Possible	Might occur at some time, unlikely to occur to every vessel but may occur to a few vessels of a particular type.
Unlikely	Unlikely to occur but should be considered as possible.
Rare	So extremely remote that it should not be considered as possible unless exceptional circumstances exist.

Table 4.2. Consequences Level of Ship Operational

Category	Work / Income / Reputation
Catastrophe	Operations halted, image / reputation is severely damaged.
Major	Major disruption to operations, temporary loss of income, image / reputation impacted.
Possible	Significant disruption to operations, image / reputation suffers.
Minor	Minor disruption to operations.
Insignificant	No adverse effect on operations.

4.4. Work Order

The maintenance planning will be executing by the worker or by the ship crew, but before the maintenance carried by those maintenance crew, the work order need to released first, because the maintenance information about the equipment that needed to do the maintenance described on the work order. Beside that work order has a role as the report whether the maintenance has been done or there is any obstacle when the maintenance carried on. The released work order can be shown on figure 4.1.



Work Order

Work Order Number : W001
Work Type : Preventiv
Work Order Status : Open
Work Priority : Low

Created by : Himawan Samudra
Assigned To : Samudra Himawan
Created time : 2016-04-07 10:31:49
Contact :0852456789

Item Code :AE1-INJ1
Status : Active
Item Name : Injector 1
Location :Main Engine
Item Running Hour : 1501
System : Non System

Problem Description : Do Maintenance

Sch Number :S001
Maintenance Activity : Take out, check, fitting

Parts and Labour Details

No.	Part Description	Available Qty	Qty Used	Qty Returned
1	Fuel Valve	1		
2				
3				

Employee Name	Employee Number	Start Date / Time	End Date / Time
Samudra Dwinsa	123456789		

Date and Time Work Started :	Date	Time
Date and Time Work Complete :	Date	Time

CERTIFICATION OF WORK COMPLETION

Name and Signature of Technician / Engineer		Name and Signature of Requestor / Supervisor	
_____	_____	_____	_____
Name	Signature	Name	Signature

Figure 4.1. Printed Work Order Form

The information that carried on the work order above shown in table 4.3, following the standard from British Standard BS EN 13460:2002.

Table 4.3. Work Order Information (source: BS EN 13460: 2002**)**

Work order information	**Information description**
B.1 Number	Code assigned to a W.O.. This code is unique for each W.O.
B.2 Petitioner	Name of the authorized person requesting the maintenance service
B.3 registration date	Date when the W.O. is issued.
B.4 open date	Date when the W.O. is activated.
B.5 close date	Date when the W.O. is completed. The corresponding work is finished.
B.6 item code	Code assigned to the equipment within the physical structure of the plant. This code is unique for each piece of equipment.
B.7 item location	Code corresponding to the geographical location of the equipment within the plant. It is normally attached to or is included in the equipment code.

Table 4.3. Work Order Information (continue)

Work order information	Information description
B.8 item running hour	Parameter by means of which, the utilization of the equipment can be recorded. The parameter can be different, such as number of operations, pieces, natural calendar.
B.9 Type of maintenance	Code referring to the nature of the maintenance activity (for example preventive electrical, new installation...). Usually, it is linked to the cost structure.
B.10 Priority	Code to give information about the necessary precedence among the W.O.s for its activation. Priority has in some cases to do with criticality.
B.11 Complaint	Reason why a W.O. is issued. Symptom of the failure, normally detected by the user of the equipment.

Table 4.3. Work Order Information (continue)

Work order information	Information description
B.12 Failing Part	Malfunctioned component of the equipment. The repair or substitution of this part and the description of the actuation of these measures.
B.13 Cause of Failure	Reason which determined the failure of the part, according to the maintenance technician criteria.
B.14 Actuation Description	Explanation of the carried out operations
B.15 Labor Amount	Working hours spent in carrying out the W.O; the sort of hours: normal, shift, night, extra, etc. should be specified.
B.16 Labor Type	Personnel category or skills of those who carried out the W.O.
B.17 Personnel	List of all maintenance workers, who participated in carrying out the W.O.

Table 4.3. Work Order Information (continue)

B.18 Spare-parts reference	**Code list of all spare-parts used within the W.O.**
B.19 Spare-parts amount	Number of each spare-part type used within the W.O.
B.20 Acceptance	Maintenance work reception.

All of the information from work order need to be completed so there was no mistake or miscommunication when the maintenance carried by the worker or the maintenance crew that can harm the ship equipment.

4.5. Features

The modules for the web will be referenced from several the existing maintenance management application. The modules that will be created on this web-based maintenance are:

a. Manage equipment and maintenance activity.
b. Manage spare part quantity.
c. Record all of the breakdown equipment time.
d. Keep running hour of each equipment
e. Help decision making on maintenance, based on when the next stop of the ship and risk level.
f. Digital form of work order.
g. Maintenance Reminder System.

The modules or the features based on the basic maintenance management from NORSOK STANDARD Z-008, and several feature from the existing maintenance management application.

The user of this web-based maintenance will be propose for:

a. Educational
b. Small company
c. Web Developer

4.6. Web Design

First step to start programming software is decided how the programs will work, and specified any data which the program used and defined all the process that the program should have done. Generally, the way how the program will work is by compiled it in the program flowchart. Program flowchart will show general process and steps that the program should have passed for every command or event which given to the programs. Further will be discussed how the Management Maintenance was designed and how the program works. Using macromedia dreamweaver 8 as tool to create web page interface and MySQL as database language with help from PHP MyAdmin that make MySQL into PHP programing language. To develop a web or program, beside to decide how the programs will work, the work flow and information flow need to be develop, because without the workflow it's hard to create webpages on purpose. The workflow for this web shown on figure 4.2.

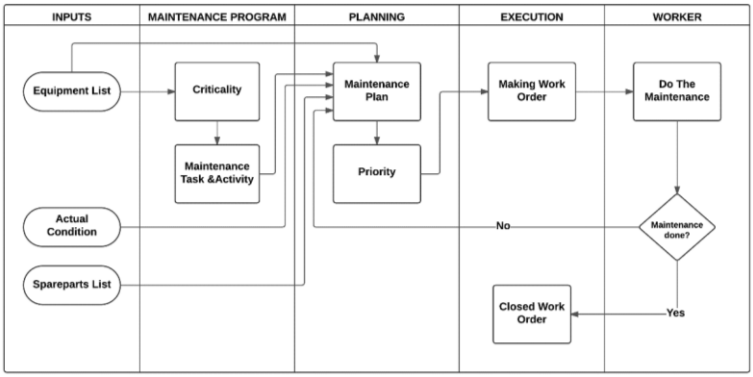


Figure 4.2. Workflow of Web

Table 4.4. Workflow information

No.	Step	Activity	Information	Capture on
1	Equipment List	Input item list from machinery system.	- Item name - Item code - Class - System	Asset
2	Actual Condition	Input actual condition of each item.	- Item code - Work hour - Status - Notes	Input data
3	Spare parts List	Input spare part for each equipment	- Spare part number - Item name - Item Code - Spare part - Quantity	Asset

Table 4.4. Workflow information (continue)

No.	Step	Activity	Information	Capture on
4	Criticality	List all of critical item, based on critical level criteria by NORSOK Z-008.	- Critical item	Database only
5	Maintenance Task & Activity	Make maintenance activity for each item based on maintenance manual book.	- Item code - Schedule number - Maintenance activity - Maintenance type - Frequency time	Maintenance Activity

Table 4.4. Workflow information (continue)

No.	Step	Activity	Information	Capture on
6	Maintenance Plan	Make maintenance plan on each item based on actual condition of each item. Make plan for failure work order	- When the maintenance can be held.	Reminder System.
7	Priority	List of priority of maintenance plan based on requirement or work hours.	- Work priority	Database

Table 4.4. Workflow information (continue)

No.	Step	Activity	Information	Capture on
8	Making Work Order	Make work order based on schedule and work priority	- WO number - WOtype - Work type - Schedule number - Task Number - Priority - Item code - Item status - Description - Employee - Spare parts - Created date - Assign work order - Requester work order	Work Order
9	Do The Maintenance	Do maintenance base on open work order by the worker	- Work order status	Work Order
10	Closed Work Order	Close the finished work order.	- Closed work order	Work Order

The figure 4.2 shows the workflow, while Table 4.4 explain the information flow in this web based on the figure 4.2. The workflow shows about what activity or what work that happen in this web, and the information flow show about what information that carryon from each activity to the other activity. The connection between the activity to the other activity and the information that collected or needed to do the next activity is shown on the table above. If the information of from the previous activity didn't complete it can cause the whole work of the web will be interrupted.

4.5.1. Web Structure

After all of the workflow chart developed, the next step is to make some web structure so the web that created on this project will be structured, so the connection between one page to other pages will be clearly seen on web structure. The web structure using Germanischer Lloyd Ship Management and CMMS as reference to create the web structure. The structure of the web will be shown on figure 4.3.

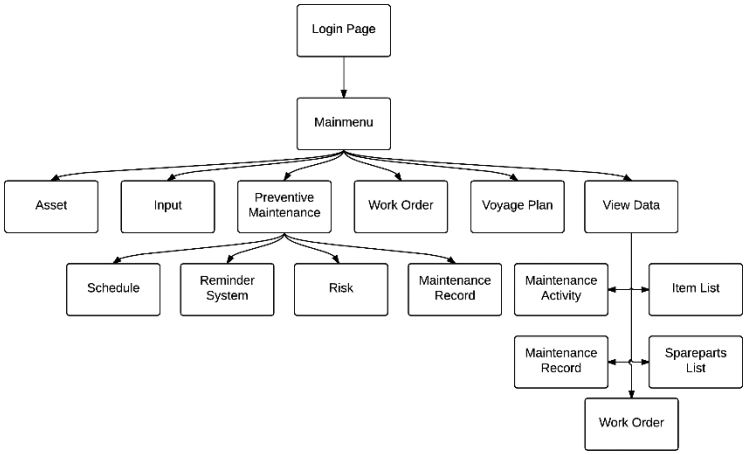


Figure 4.3. Web Structure

The web structure that shown on the figure 4.3, give the information about the relationship between one pages to the other pages. The function of its webpages is to help the web developer and the user to access and to develop he web. The web structure designed just like the map of the web, that makes easier for user and web developer to navigate each web page. The function of each web pages can be shown on the table 4.5.

Table 4.5. Web page information

No.	Webpages	Function
1	Login	Page to give permission to access the web.
2	Main Menu	The navigation for each webpage.
3	Asset	To input item, and spare part for equipment.
4	Input	To input or to update the real time data for each equipment.
5	Preventive Maintenance	Navigational page for schedule and planning simulation
6	Schedule	To input the schedule maintenance for each equipment.
7	Reminder System	To help decision making for maintenance and remind the maintenance due to maintenance frequency.

Table 4.5. Web page information (continue)

No.	Webpages	Function
8	Risk	To input risk of each activity
9	Maintenance Record	To input the data about when the equipment breakdown.
10	Work Order	To release the work order, so maintenance can be executed.
11	Voyage Plan	To input and show the voyage plan
12	View Data	Navigational page to see all of the data for Item List, spare part list, maintenance activity, maintenance record, Work Order.
13	Item List	To view all of the detail list of each equipment.
14	Spare part List	To view all of the spare part for each equipment.
15	Maintenance Activity	To view all of the maintenance activity for each equipment.
16	Maintenance Record	To show the record of maintenance activities that already done.
17	Work Order	To view all of the Work Order that has been released.

4.5.2. Web Interface

To create interface of each structure from the web, Macromedia Dreamweaver 8 used to create it. The web interface will be created using PHP or HTML, the reason why web interface need PHP language, it's because to connecting database there are PHP server between web pages and database, to access it through the PHP server, PHP language is required.

The interface will be the visual of each web structure, so the web can be accessed by the user on the front end of the web. The front end of the web has a role to record all of the information that input by the user, beside that the front end can show the information that stored on the back-end of the web, it depends on the user and the authorized user or the admin of the web. The general structure of the web interface can be shown in table 4.6.

Table 4.6. The information of web page structure

Structure	Description
Web Title	Show the main title from the web
Pages Title	The title of each pages
Ship	Shows the information about the selected ship
Navigation panel	The panel to navigate the user about the whole webpages on the web.
Field	The field where the user can input the information, or access the information from the database, or to update the information that already inputted.

4.7. Creating Database

There are two ways to store the information in the database, the first way is to input the information directly in the back-end of the web, the other way the user can input the information from the fron't end of the web. In this case, the first information will be stored to the database directly from the back-end of the web using PHP MyAdmin to manage the database in MySQL programming language. To create a good and organize database, the structure of the database is required. The connection between one information to the other information need to be seen as clearly as possible, so the user or the web developer can identify easily if there are any problem with the information or the database. The database structure can be shown in picture below.

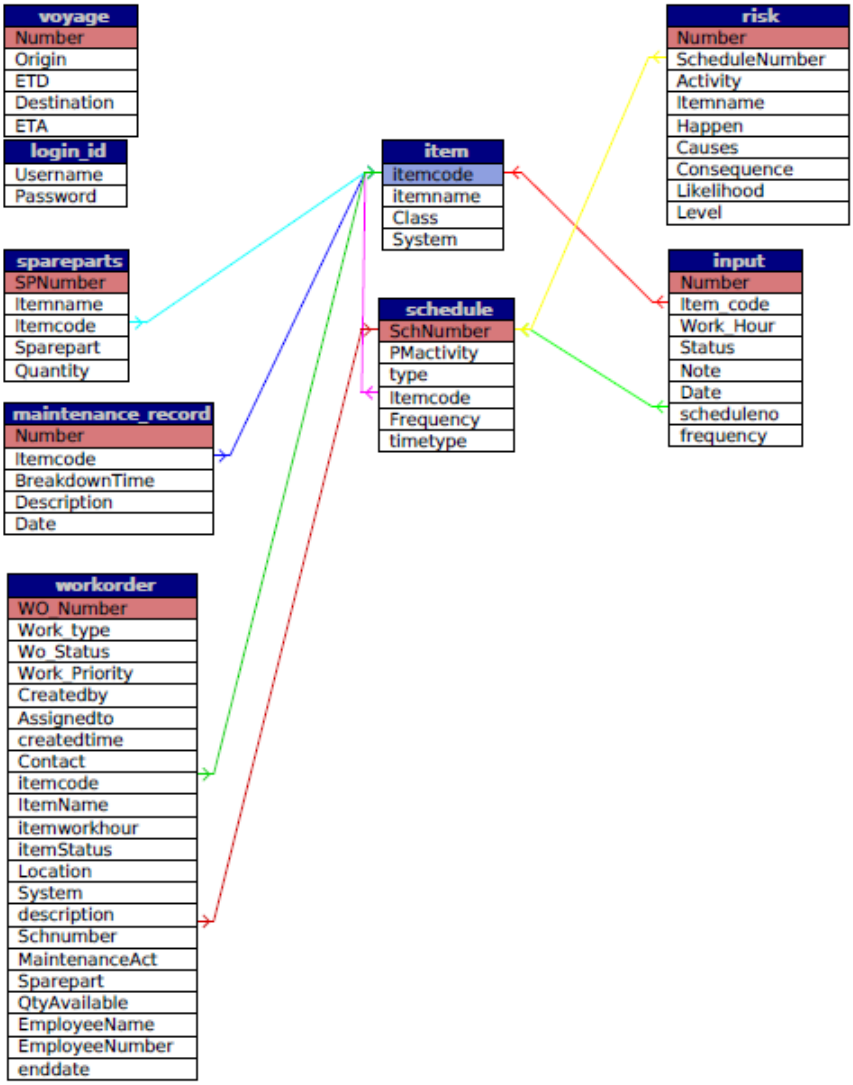


Figure 4.4. Database Schema

As shown on the figure 4.4 the relation between each table, the relation between each column represent how the information between one column to another in connected. The line shows about the connection between one column to another column from different table. The detail information about relationship between the column can be found in Enclosure 4 (Database Schema).

4.7.1. The Connection of Database and Web Interface

After the web interface and database were created, the connection between these two need to be described, the information that stored in the database can be shown on which web pages, or which web pages that stored the information to the database. Therefore, the mistake between the information that stored in the database and the web interface can be prevented. The relation between these two can be shown in figure 4.5.

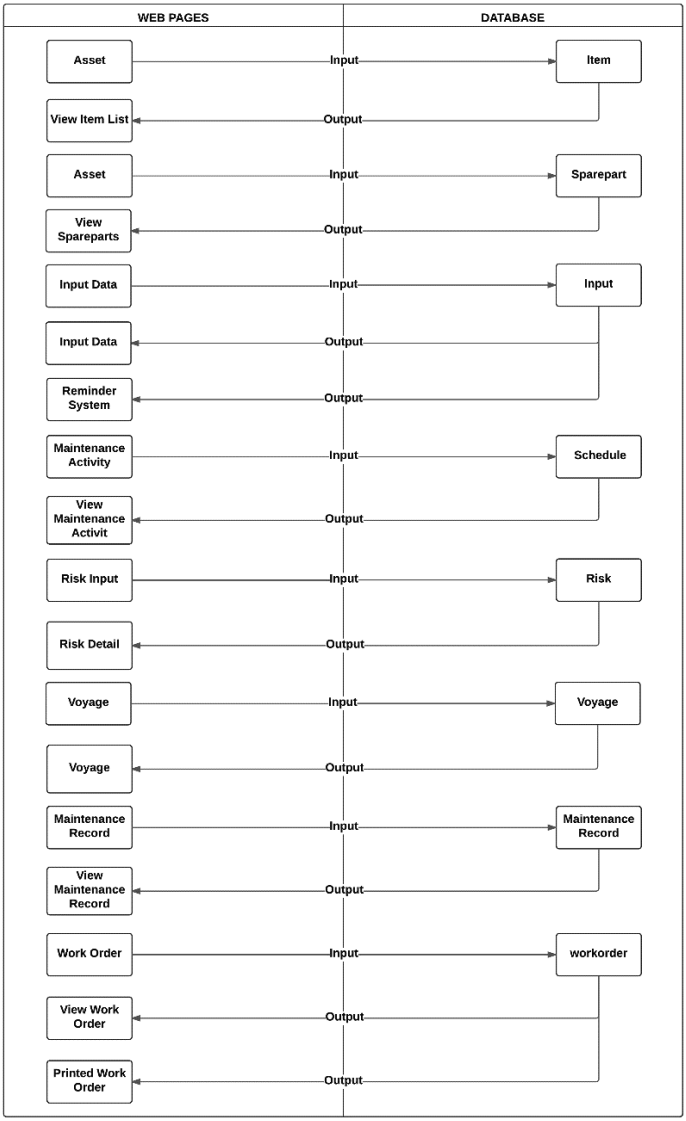


Figure 4.5. Relation Interface and Database

As shown on the figure 4.5, the information flow from webpage to database and database to webpages, it can easily identify what database that use on each webpage and where the data that inputted from one webpage stored in what database. Therefore, the relation between webpage and database need to be clear.

4.8. Programming

The programming was used to create or make the interface of the web, beside that the programming used to create a logical function on the web and to connect the web with database it required programming language. The interface usually uses HTML programming language to create web interface. The script for web interface without any content in the web can be shown on figure below.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0
Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-
transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html;
charset=iso-8859-1" />
<title>Untitled Document</title>
</head>
<body>
```

Figure 4.6. HTML Basic Language

As shown in the figure 4.6 the script starts with <*htmlxmlns="http://www.w3.org/1999/xhtml"*> and the end of language with <*/html*>. The html at the start and at the end of the language it shows that the entire page will be using HTML language, and the web will run with HTML language. Beside that the “http://www.w3.org/1999/xhtml” mean the programming language that used in the script will use the language from http://www.w3.org/1999/xhtml. To make the content of the web, the content need to be placed between <*body*> and <*/body*> so the content can be shown on the interface of the web.

```
<?php
        call information from database
?>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0
Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-
transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html;
charset=iso-8859-1" />
<title>Untitled Document</title>
</head>
<body>
        <?php
                Make logical function
        ?>

</body>
</html>
```

Figure 4.7. PHP Basic Language

For the next script that required for logical function or to connect the information from database to webpages or the otherwise, it need PHP language to execute it as shown on figure 4.7. The PHP language can be placed anywhere. The php language start with <*?php* and end it with ?> if the php only need to call the information from the database, PHP can be placed before the HTML line, but if the PHP used for logical function that need to be shown in the interface it must be place in HTML line. The example script can be shown in the figure below.

All of the script above are the basic script that will be used to create the web, each web pages have different script, it depends on the need of each webpage. All of the script that use for each page can be shown in Enclosure 5 (Web Script).

ENCLOSURE

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Enclosure 1. Equipment List

Name of Equipment	Group	System	Code
Injector 1	Main Engine	Non System	ME-INJ1
Injector 2			ME-INJ2
Injector 3			ME-INJ3
Injector 4			ME-INJ4
Injector 5			ME-INJ5
Cylinder Head 1			ME-CYH1
Cylinder Head 2			ME-CYH2
Cylinder Head 3			ME-CYH3
Cylinder Head 4			ME-CYH4
Cylinder Head 5			ME-CYH5
Piston 1			ME-PIS1
Piston 2			ME-PIS2
Piston 3			ME-PIS3
Piston 4			ME-PIS4
Piston 5			ME-PIS5
Connecting Rod 1			ME-COR1
Connecting Rod 2			ME-COR2
Connecting Rod 3			ME-COR3
Connecting Rod 4			ME-COR4
Connecting Rod 5			ME-COR5
Cylinder Liner 1			ME-CYL1
Cylinder Liner 2			ME-CYL2
Cylinder Liner 3			ME-CYL3
Cylinder Liner 4			ME-CYL4
Cylinder Liner 5			ME-CYL5
Crankshaft 1			ME-CRS1

Crankshaft 2			ME-CRS2
Crankshaft 3			ME-CRS3
Crankshaft 4			ME-CRS4
Crankshaft 5			ME-CRS5
Main Bearing 1			ME-MBE1
Main Bearing 2			ME-MBE2
Main Bearing 3			ME-MBE3
Main Bearing 4			ME-MBE4
Main Bearing 5			ME-MBE5
Camshaft			ME-CAS
Timing Gear			ME-TGR
Governor			ME-GOV
Turbocharge			ME-TCH
Boost Air Cooler			ME-BAC
Air Starter Motor			ME-ASM
Fuel Injection Pump		Fuel Oil System	ME-FOS-FIP
Fuel Feed Pump			ME-FOS-FFP
FO control & Stop Air Piston			ME-FOS-FOC
Lub Oil		Lub Oil System	ME-LOS-LO
Lub Oil Cooler			ME-LOS-LOC
Thermostatic Valve			ME-LOS-THV
Lub Oil Pump			ME-LOS-LOP
Turbocharge LO Stainer			ME-LOS-TLS
Thermostatic Valve		Cooling Water System	ME-CWS-THV
Cooling Water Pump			ME-CWS-CWP
Fresh Water Cooler			ME-CWS-FWC
Cooling Water			ME-CWS-CW

Seawater Cooling Parts			ME-CWS-SCP
Inejctor 1	Auxiliary Engine 1	Non System	AE1-INJ1
Inejctor 2			AE1-INJ2
Inejctor 3			AE1-INJ3
Inejctor 4			AE1-INJ4
Inejctor 5			AE1-INJ5
Inejctor 6			AE1-INJ6
Cylinder Head 1			AE1-CYH1
Cylinder Head 2			AE1-CYH2
Cylinder Head 3			AE1-CYH3
Cylinder Head 4			AE1-CYH4
Cylinder Head 5			AE1-CYH5
Cylinder Head 6			AE1-CYH6
Piston 1			AE1-PIS1
Piston 2			AE1-PIS2
Piston 3			AE1-PIS3
Piston 4			AE1-PIS4
Piston 5			AE1-PIS5
Piston 6			AE1-PIS6
Connecting Rod 1			AE1-COR1
Connecting Rod 2			AE1-COR2
Connecting Rod 3			AE1-COR3
Connecting Rod 4			AE1-COR4
Connecting Rod 5			AE1-COR5
Connecting Rod 6			AE1-COR6
Cylinder Liner 1			AE1-CYL1
Cylinder Liner 2			AE1-CYL2

Cylinder Liner 3			AE1-CYL3
Cylinder Liner 4			AE1-CYL4
Cylinder Liner 5			AE1-CYL5
Cylinder Liner 6			AE1-CYL6
Crankshaft 1			AE1-CRS1
Crankshaft 2			AE1-CRS2
Crankshaft 3			AE1-CRS3
Crankshaft 4			AE1-CRS4
Crankshaft 5			AE1-CRS5
Crankshaft 6			AE1-CRS6
Main Bearing 1			AE1-MBE1
Main Bearing 2			AE1-MBE2
Main Bearing 3			AE1-MBE3
Main Bearing 4			AE1-MBE4
Main Bearing 5			AE1-MBE5
Main Bearing 6			AE1-MBE6
Camshaft			AE1-CAS
Governor			AE1-GOV
Turbocharge			AE1-TCH
Fuel Injection Pump		Fuel Oil System	AE1-FOS-FIP
Fuel Feed Pump			AE1-FOS-FFP
Fuel Oil Filter			AE1-FOC-FOF
Lub Oil		Lub Oil System	AE1-LOS-LO
Lub Oil Cooler			AE1-LOS-LOC
Thermostatic Valve			AE1-LOS-THV
Lub Oil Pump			AE1-LOS-LOP
Lub Oil Filter			AE1-LOS-LOF
Thermostatic Valve		Cooling	AE1-CWS-THV

Cooling Water Pump		Water System	AE1-CWS-CWP
Intercooler			AE1-CWS-INT
Inejctor 1	Auxiliary Engine 2	Non System	AE2-INJ1
Inejctor 2			AE2-INJ2
Inejctor 3			AE2-INJ3
Inejctor 4			AE2-INJ4
Inejctor 5			AE2-INJ5
Inejctor 6			AE2-INJ6
Cylinder Head 1			AE2-CYH1
Cylinder Head 2			AE2-CYH2
Cylinder Head 3			AE2-CYH3
Cylinder Head 4			AE2-CYH4
Cylinder Head 5			AE2-CYH5
Cylinder Head 6			AE2-CYH6
Piston 1			AE2-PIS1
Piston 2			AE2-PIS2
Piston 3			AE2-PIS3
Piston 4			AE2-PIS4
Piston 5			AE2-PIS5
Piston 6			AE2-PIS6
Connecting Rod 1			AE2-COR1
Connecting Rod 2			AE2-COR2
Connecting Rod 3			AE2-COR3
Connecting Rod 4			AE2-COR4
Connecting Rod 5			AE2-COR5
Connecting Rod 6			AE2-COR6
Cylinder Liner 1			AE2-CYL1
Cylinder Liner 2			AE2-CYL2

Cylinder Liner 3			AE2-CYL3
Cylinder Liner 4			AE2-CYL4
Cylinder Liner 5			AE2-CYL5
Cylinder Liner 6			AE2-CYL6
Crankshaft 1			AE2-CRS1
Crankshaft 2			AE2-CRS2
Crankshaft 3			AE2-CRS3
Crankshaft 4			AE2-CRS4
Crankshaft 5			AE2-CRS5
Crankshaft 6			AE2-CRS6
Main Bearing 1			AE2-MBE1
Main Bearing 2			AE2-MBE2
Main Bearing 3			AE2-MBE3
Main Bearing 4			AE2-MBE4
Main Bearing 5			AE2-MBE5
Main Bearing 6			AE2-MBE6
Camshaft			AE2-CAS
Governor			AE2-GOV
Turbocharge			AE2-TCH
Fuel Injection Pump		Fuel Oil System	AE2-FOS-FIP
Fuel Feed Pump			AE2-FOS-FFP
Fuel Oil Filter			AE2-FOC-FOF
Lub Oil		Lub Oil System	AE2-LOS-LO
Lub Oil Cooler			AE2-LOS-LOC
Thermostatic Valve			AE2-LOS-THV
Lub Oil Pump			AE2-LOS-LOP
Lub Oil Filter			AE2-LOS-LOF
Thermostatic Valve		Cooling	AE2-CWS-THV

Cooling Water Pump		Water System	AE2-CWS-CWP
Intercooler			AE2-CWS-INT
Inejctor 1	Auxiliary Engine 3	Non System	AE3-INJ1
Inejctor 2			AE3-INJ2
Inejctor 3			AE3-INJ3
Inejctor 4			AE3-INJ4
Inejctor 5			AE3-INJ5
Inejctor 6			AE3-INJ6
Cylinder Head 1			AE3-CYH1
Cylinder Head 2			AE3-CYH2
Cylinder Head 3			AE3-CYH3
Cylinder Head 4			AE3-CYH4
Cylinder Head 5			AE3-CYH5
Cylinder Head 6			AE3-CYH6
Piston 1			AE3-PIS1
Piston 2			AE3-PIS2
Piston 3			AE3-PIS3
Piston 4			AE3-PIS4
Piston 5			AE3-PIS5
Piston 6			AE3-PIS6
Connecting Rod 1			AE3-COR1
Connecting Rod 2			AE3-COR2
Connecting Rod 3			AE3-COR3
Connecting Rod 4			AE3-COR4
Connecting Rod 5			AE3-COR5
Connecting Rod 6			AE3-COR6
Cylinder Liner 1			AE3-CYL1
Cylinder Liner 2			AE3-CYL2

Cylinder Liner 3			AE3-CYL3
Cylinder Liner 4			AE3-CYL4
Cylinder Liner 5			AE3-CYL5
Cylinder Liner 6			AE3-CYL6
Crankshaft 1			AE3-CRS1
Crankshaft 2			AE3-CRS2
Crankshaft 3			AE3-CRS3
Crankshaft 4			AE3-CRS4
Crankshaft 5			AE3-CRS5
Crankshaft 6			AE3-CRS6
Main Bearing 1			AE3-MBE1
Main Bearing 2			AE3-MBE2
Main Bearing 3			AE3-MBE3
Main Bearing 4			AE3-MBE4
Main Bearing 5			AE3-MBE5
Main Bearing 6			AE3-MBE6
Camshaft			AE3-CAS
Governor			AE3-GOV
Turbocharge			AE3-TCH
Fuel Injection Pump		Fuel Oil System	AE3-FOS-FIP
Fuel Feed Pump			AE3-FOS-FFP
Fuel Oil Filter			AE3-FOC-FOF
Lub Oil		Lub Oil System	AE3-LOS-LO
Lub Oil Cooler			AE3-LOS-LOC
Thermostatic Valve			AE3-LOS-THV
Lub Oil Pump			AE3-LOS-LOP
Lub Oil Filter			AE3-LOS-LOF
Thermostatic Valve		Cooling	AE3-CWS-THV

Cooling water pump		Water System	AE3-CWS-CWP
Intercooler			AE3-CWS-INT

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Enclosure 2. Spare Parts List

Number	Name of Equipment	Code	Spare Parts	QTY set
S001	Injector	ME-INJ	Fuel oil pressure booster complete, for each cyl.	5
S002	Cylinder Head	ME-CYH	Cylinder cover with fuel, exhaust and starting valves, indicator valve abd sealing ring	1
S003	Cylinder Head	ME-CYH	Studs for cylinder cover	0.5
S004	Piston	ME-PIS	Piston complete (with cooling pipe), piston rod, piston rings and stuffing box, studs and nuts	1
S005	Piston	ME-PIS	Piston rings set for each cylinder	5
S006	Connecting Rod	ME-COR	Telescopic pipe with bushing for each cylinder	5
S007	Connecting Rod	ME-COR	Crankpin bearing shells in 2/2 with studs and nuts	1
S008	Connecting Rod	ME-COR	Crosshead bearing shell lower part with studs and nuts	1
S009	Connecting Rod	ME-COR	Thrust Piece	2
S010	Cylinder Liner	ME-CYL	Cylinder liner inclusive of sealing rings and gasket	1
S011	Crankshaft	ME-CRS		
S012	Main Bearing	ME-MBE	Thrust pads for one face of each size	1
S013	Main Bearing	ME-MBE	Main bearing shell 2/2 each size	1

S014	Main Bearing	ME-MBE	Studs and nuts set for each main bearing	6
S015	Camshaft	ME-CAS	Bearing for camshaft at chain drive, chine tightener and intermediate shaft	1
S016	Camshaft	ME-CAS	Guide ring 2/2 for camshaft	1
S017	Turbocharge	ME-TCH	Spare rotor for one turbocharger, including: compressor wheel, rotor shaft with turbine blades and partition wall,	1
S018	Air Starter Motor	ME-ASM	Starting valve, complete	1
S019	Fuel Feed Pump	ME-FOS-FFP	Fuel pump barrel, complete with plunger	1
S020	Fuel Feed Pump	ME-FOS-FFP	Suction and puncture valve, complete	1
S021	FO control & Stop Air Piston	ME-FOS-FOC	Electronic fuel injection cotrol valve	1
S022	Lub Oil	ME-LOS-LO	set 10 μ filter	1
S023	Seawater Cooling Parts	ME-CWS-SCP	Gaskets for butterfly valve and compensator	1
S024	Inejctor	AE1-INJ	Sealing ring	4
S025	Cylinder Head	AE1-CYH	Valve spindle, inlet and exhaust	4
S026	Cylinder Head	AE1-CYH	Conical ring in 2/2	4
S027	Cylinder Head	AE1-CYH	Inner spring	4
S028	Cylinder	AE1-	Outer spring	4

	Head	CYH		
S029	Cylinder Head	AE1-CYH	Valve seat ring, inlet	2
S030	Cylinder Head	AE1-CYH	Valve seat ring, exhaust	4
S031	Cylinder Head	AE1-CYH	Gasket, coaming	1
S032	Cylinder Head	AE1-CYH	Gasket, top cover	1
S033	Cylinder Head	AE1-CYH	O-ring, cylinder head	2
S034	Cylinder Head	AE1-CYH	Valve rotators	4
S035	Piston	AE1-PIS	Sealing ring	1
S036	Piston	AE1-PIS	Piston pin	1
S037	Piston	AE1-PIS	Retaining ring	2
S038	Piston	AE1-PIS	Piston ring	3
S039	Piston	AE1-PIS	Oil scraper ring	1
S040	Piston	AE1-PIS	O-ring, inlet bend	1
S041	Piston	AE1-PIS	O-ring, cooling water connections	8
S042	Connecting Rod	AE1-COR	Connecting rod stud	2
S043	Connecting Rod	AE1-COR	Connecting rod nut	2
S044	Connecting Rod	AE1-COR	Connecting rod bearing	1
S045	Connecting Rod	AE1-COR	Bush for connecting rod	1
S046	Cylinder Liner	AE1-CYL	O-ring, cylinder liner	2
S047	Main Bearing	AE1-MBE	Main bearing shells	1
S048	Turbocharge	AE1-TCH	Gasket	1
S049	Turbocharge	AE1-	O-ring, cooling water	2

		TCH	connections	
S050	Fuel Injection Pump	AE1-FOS-FIP	Fuel oil injection pump, 720/750 rpm	1
S051	Fuel Injection Pump	AE1-FOS-FIP	Fuel oil injection pump, 900 rpm	1
S052	Inejctor	AE2-INJ	Sealing ring	4
S053	Cylinder Head	AE2-CYH	Valve spindle, inlet and exhaust	4
S054	Cylinder Head	AE2-CYH	Conical ring in 2/2	4
S055	Cylinder Head	AE2-CYH	Inner spring	4
S056	Cylinder Head	AE2-CYH	Outer spring	4
S057	Cylinder Head	AE2-CYH	Valve seat ring, inlet	2
S058	Cylinder Head	AE2-CYH	Valve seat ring, exhaust	4
S059	Cylinder Head	AE2-CYH	Gasket, coaming	1
S060	Cylinder Head	AE2-CYH	Gasket, top cover	1
S061	Cylinder Head	AE2-CYH	O-ring, cylinder head	2
S062	Cylinder Head	AE2-CYH	Valve rotators	4
S063	Piston	AE2-PIS	Sealing ring	1
S064	Piston	AE2-PIS	Piston pin	1
S065	Piston	AE2-PIS	Retaining ring	2
S066	Piston	AE2-PIS	Piston ring	3
S067	Piston	AE2-PIS	Oil scraper ring	1
S068	Piston	AE2-PIS	O-ring, inlet bend	1
S069	Piston	AE2-PIS	O-ring, cooling water connections	8
S070	Connecting	AE2-	Connecting rod stud	2

	Rod	COR		
S071	Connecting Rod	AE2-COR	Connecting rod nut	2
S072	Connecting Rod	AE2-COR	Connecting rod bearing	1
S073	Connecting Rod	AE2-COR	Bush for connecting rod	1
S074	Cylinder Liner	AE2-CYL	O-ring, cylinder liner	2
S075	Main Bearing	AE2-MBE	Main bearing shells	1
S076	Turbocharge	AE2-TCH	Gasket	1
S077	Turbocharge	AE2-TCH	O-ring, cooling water connections	2
S078	Fuel Injection Pump	AE2-FOS-FIP	Fuel oil injection pump, 720/750 rpm	1
S079	Fuel Injection Pump	AE2-FOS-FIP	Fuel oil injection pump, 900 rpm	1
S080	Inejctor	AE3-INJ	Sealing ring	4
S081	Cylinder Head	AE3-CYH	Valve spindle, inlet and exhaust	4
S082	Cylinder Head	AE3-CYH	Conical ring in 2/2	4
S083	Cylinder Head	AE3-CYH	Inner spring	4
S084	Cylinder Head	AE3-CYH	Outer spring	4
S085	Cylinder Head	AE3-CYH	Valve seat ring, inlet	2
S086	Cylinder Head	AE3-CYH	Valve seat ring, exhaust	4
S087	Cylinder Head	AE3-CYH	Gasket, coaming	1
S088	Cylinder Head	AE3-CYH	Gasket, top cover	1
S089	Cylinder	AE3-	O-ring, cylinder head	2

	Head	CYH		
S090	Cylinder Head	AE3-CYH	Valve rotators	4
S091	Piston	AE3-PIS	Sealing ring	1
S092	Piston	AE3-PIS	Piston pin	1
S093	Piston	AE3-PIS	Retaining ring	2
S094	Piston	AE3-PIS	Piston ring	3
S095	Piston	AE3-PIS	Oil scraper ring	1
S096	Piston	AE3-PIS	O-ring, inlet bend	1
S097	Piston	AE3-PIS	O-ring, cooling water connections	8
S098	Connecting Rod	AE3-COR	Connecting rod stud	2
S099	Connecting Rod	AE3-COR	Connecting rod nut	2
S100	Connecting Rod	AE3-COR	Connecting rod bearing	1
S101	Connecting Rod	AE3-COR	Bush for connecting rod	1
S102	Cylinder Liner	AE3-CYL	O-ring, cylinder liner	2
S103	Main Bearing	AE3-MBE	Main bearing shells	1
S104	Turbocharge	AE3-TCH	Gasket	1
S105	Turbocharge	AE3-TCH	O-ring, cooling water connections	2
S106	Fuel Injection Pump	AE3-FOS-FIP	Fuel oil injection pump, 720/750 rpm	1
S107	Fuel Injection Pump	AE3-FOS-FIP	Fuel oil injection pump, 900 rpm	1

Enclosure 3. Maintenance Activity

sch	pm activity	type	itemcode	Frequency (hour)
S001	1. Take out, check, fitting	Preventive	ME-INJ1	1500
S002	1. Take out, check, fitting	Preventive	ME-INJ2	1500
S003	1. Take out, check, fitting	Preventive	ME-INJ3	1500
S004	1. Take out, check, fitting	Preventive	ME-INJ4	1500
S005	1. Take out, check, fitting	Preventive	ME-INJ5	1500
S006	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH1	1500
S007	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH2	1500
S008	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH3	1500
S009	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH4	1500
S010	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH5	1500
S011	1. Check Valve Spring 2. Open and check Valve Rotator	Preventive	ME-CYH1	5000
S012	1. Check Valve Spring 2. Open and check Valve Rotator	Preventive	ME-CYH2	5000
S013	1. Check Valve Spring 2. Open and check Valve Rotator	Preventive	ME-CYH3	5000
S014	1. Check Valve Spring 2. Open and check Valve Rotator	Preventive	ME-CYH4	5000
S015	1. Check Valve Spring 2. Open and check Valve Rotator	Preventive	ME-CYH5	5000

S016	1. Open Cylinder Head and clean up 2. Grinding Suction and Exhaust Valve Seat 3. Clean up Water Chamber from crust and Hydraulic Test 4. Replace Stem Seal Suction and Exhaust Valve 5. Check the tightness value of Cylinder Head Bolt	Preventive	ME-CYH1	10000
S017	1. Open Cylinder Head and clean up 2. Grinding Suction and Exhaust Valve Seat 3. Clean up Water Chamber from crust and Hydraulic Test 4. Replace Stem Seal Suction and Exhaust Valve 5. Check the tightness value of Cylinder Head Bolt	Preventive	ME-CYH2	10000
S018	1. Open Cylinder Head and clean up 2. Grinding Suction and Exhaust Valve Seat 3. Clean up Water Chamber from crust and Hydraulic Test 4. Replace Stem Seal Suction and Exhaust Valve 5. Check the tightness value of Cylinder Head Bolt	Preventive	ME-CYH3	10000

S019	1. Open Cylinder Head and clean up 2. Grinding Suction and Exhaust Valve Seat 3. Clean up Water Chamber from crust and Hydraulic Test 4. Replace Stem Seal Suction and Exhaust Valve 5. Check the tightness value of Cylinder Head Bolt	Preventive	ME-CYH4	10000
S020	1. Open Cylinder Head and clean up 2. Grinding Suction and Exhaust Valve Seat 3. Clean up Water Chamber from crust and Hydraulic Test 4. Replace Stem Seal Suction and Exhaust Valve 5. Check the tightness value of Cylinder Head Bolt	Preventive	ME-CYH5	10000
S021	1. Take out, clean up, check and measure piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	ME-PIS1	10000
S022	1. Take out, clean up, check and measure piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	ME-PIS2	10000

S023	1. Take out, clean up, check and measure piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	ME-PIS3	10000
S024	1. Take out, clean up, check and measure piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	ME-PIS4	10000
S025	1. Take out, clean up, check and measure piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	ME-PIS5	10000
S026	1. Check and measure Piston Pin Metal 2. Check and measure Crank Pin Metal 3. Check the tightness value of Connecting Rod Bolt	Preventive	ME-COR1	10000
S027	1. Check and measure Piston Pin Metal 2. Check and measure Crank Pin Metal 3. Check the tightness value of Connecting Rod Bolt	Preventive	ME-COR2	10000
S028	1. Check and measure Piston Pin Metal 2. Check and measure Crank Pin Metal 3. Check the tightness value of Connecting Rod Bolt	Preventive	ME-COR3	10000

S029	1. Check and measure Piston Pin Metal 2. Check and measure Crank Pin Metal 3. Check the tightness value of Connecting Rod Bolt	Preventive	ME-COR4	10000
S030	1. Check and measure Piston Pin Metal 2. Check and measure Crank Pin Metal 3. Check the tightness value of Connecting Rod Bolt	Preventive	ME-COR5	10000
S031	1. Clean up, check and measure inner diameter	Preventive	ME-CYL1	10000
S032	1. Clean up, check and measure inner diameter	Preventive	ME-CYL2	10000
S033	1. Clean up, check and measure inner diameter	Preventive	ME-CYL3	10000
S034	1. Clean up, check and measure inner diameter	Preventive	ME-CYL4	10000
S035	1. Clean up, check and measure inner diameter	Preventive	ME-CYL5	10000
S036	1. Take out, clean up and check water jacket section	Preventive	ME-CYL1	20000
S037	1. Take out, clean up and check water jacket section	Preventive	ME-CYL2	20000
S038	1. Take out, clean up and check water jacket section	Preventive	ME-CYL3	20000
S039	1. Take out, clean up and check water jacket section	Preventive	ME-CYL4	20000
S040	1. Take out, clean up and check water jacket section	Preventive	ME-CYL5	20000
S041	1. Measure Web Deflection	Preventive	ME-CRS1	2500
S042	1. Measure Web Deflection	Preventive	ME-CRS2	2500

S043	1. Measure Web Deflection	Preventive	ME-CRS3	2500
S044	1. Measure Web Deflection	Preventive	ME-CRS4	2500
S045	1. Measure Web Deflection	Preventive	ME-CRS5	2500
S046	1. Measure Journal and outter diameter of Crank Pin	Preventive	ME-CRS1	10000
S047	1. Measure Journal and outter diameter of Crank Pin	Preventive	ME-CRS2	10000
S048	1. Measure Journal and outter diameter of Crank Pin	Preventive	ME-CRS3	10000
S049	1. Measure Journal and outter diameter of Crank Pin	Preventive	ME-CRS4	10000
S050	1. Measure Journal and outter diameter of Crank Pin	Preventive	ME-CRS5	10000
S051	1. Open, check and measure Metal 2. Check the tightness value of clamp Bolt 3. Check the tightness value of Side Bolt	Preventive	ME-MBE1	10000
S052	1. Open, check and measure Metal 2. Check the tightness value of clamp Bolt 3. Check the tightness value of Side Bolt	Preventive	ME-MBE2	10000
S053	1. Open, check and measure Metal 2. Check the tightness value of clamp Bolt 3. Check the tightness	Preventive	ME-MBE3	10000

	value of Side Bolt			
S054	1. Open, check and measure Metal 2. Check the tightness value of clamp Bolt 3. Check the tightness value of Side Bolt	Preventive	ME-MBE4	10000
S055	1. Open, check and measure Metal 2. Check the tightness value of clamp Bolt 3. Check the tightness value of Side Bolt	Preventive	ME-MBE5	10000
S056	1. Check the condition of Cam and Roller Bearing	Preventive	ME-CAS	5000
S057	1. Open and check the Fuel Pump Tappet 2. Open, check and measure Swing Arm	Preventive	ME-CAS	10000
S058	1. Take out the Camshaft, Check the Bearing dan Measure	Preventive	ME-CAS	20000
S059	1. Check Bearing Gear dan Backlash	Preventive	ME-TGR	10000
S060	1. Open Idle Gear, check and measure Bearing 2. Check the tightness value of Idle Gear Mounted Bolt	Preventive	ME-TGR	20000
S061	1. Replace Hydraulic Oil	Preventive	ME-GOV	2500
S062	1. Open and check the Governor 2. Open and check the Bearing Gear on Driving Gear	Preventive	ME-GOV	10000

S063	1. Open and clean up 2. Check and measure Clearance (axial and radial)	Preventive	ME-TCH	5000
S064	1. Open, check, clean up and Hydraulic test	Preventive	ME-BAC	5000
S065	1. Open and clean up Muffler Element (wash by neutral detergent) 2. Off from Main Engine, rotate the pinion gear, check is the rotation is light and no unnormal noise	Preventive	ME-ASM	2500
S066	1. Open, check, clean up and replace grease, replace O-ring, replace Bearing and gear on First Reduction Gear	Preventive	ME-ASM	10000
S067	1. Open, check, clean up and replace grease, replace O-ring, replace Bearing and grease on First dan Second Reduction Gear	Preventive	ME-ASM	20000
S068	1. Check Injection timing 2. Check and replace Deflector	Preventive	ME-FOS-FIP	2500
S069	1. Open, clean up and check	Preventive	ME-FOS-FIP	5000
S070	1. Open and check 2. Replace seal oil	Preventive	ME-FOS-FFP	5000
S071	1. Replace O-ring	Preventive	ME-FOS-FOC	10000
S072	1. Replace (depends on analysis result)	Preventive	ME-LOS-LO	1500
S073	1. Open, clean up, check, hydraulic test	Preventive	ME-LOS-LOC	10000

S074	1. Open, clean up and check	Preventive	ME-LOS-THV	5000
S075	1. Open, clean up, check and measure 2. Open and check Press Regulating Valve and Safety valve	Preventive	ME-LOS-LOP	10000
S076	1. Replace strainer element	Preventive	ME-LOS-TLS	1500
S077	1. Open, clean up and check	Preventive	ME-CWS-THV	2500
S078	1. Open, clean up and measure 2. Replace Mechanical Seal	Preventive	ME-CWS-CWP	5000
S079	1. Open, clean up, check, and Hydraulic Test	Preventive	ME-CWS-FWC	5000
S080	1. Replace (depends on analysis result)	Preventive	ME-CWS-CW	5000
S081	1.Check Zinc Anode and replace (on Air Cooler and Lub Oil Cooler)	Preventive	ME-CWS-SCP	1500
S082	1. Adjustment, of opening pressure	Preventive	AE1-INJ1	2000
S083	1. Adjustment, of opening pressure	Preventive	AE1-INJ2	2000
S084	1. Adjustment, of opening pressure	Preventive	AE1-INJ3	2000
S085	1. Adjustment, of opening pressure	Preventive	AE1-INJ4	2000
S086	1. Adjustment, of opening pressure	Preventive	AE1-INJ5	2000
S087	1. Adjustment, of opening pressure	Preventive	AE1-INJ6	2000
S088	1. Retightening Cylinder head bolt	Preventive	AE1-CYH1	200
S089	1. Retightening Cylinder head bolt	Preventive	AE1-CYH2	200

S090	1. Retightening Cylinder head bolt	Preventive	AE1-CYH3	200
S091	1. Retightening Cylinder head bolt	Preventive	AE1-CYH4	200
S092	1. Retightening Cylinder head bolt	Preventive	AE1-CYH5	200
S093	1. Retightening Cylinder head bolt	Preventive	AE1-CYH6	200
S094	1. Open and check Valve Rotator	Preventive	AE1-CYH1	2000
S095	1. Open and check Valve Rotator	Preventive	AE1-CYH2	2000
S096	1. Open and check Valve Rotator	Preventive	AE1-CYH3	2000
S097	1. Open and check Valve Rotator	Preventive	AE1-CYH4	2000
S098	1. Open and check Valve Rotator	Preventive	AE1-CYH5	2000
S099	1. Open and check Valve Rotator	Preventive	AE1-CYH6	2000
S100	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE1-CYH1	16000
S101	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector	Preventive	AE1-CYH2	16000

	4. Inspection cylinder head cooling water space			
S102	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE1-CYH3	16000
S103	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE1-CYH4	16000
S104	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE1-CYH5	16000

S105	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE1-CYH6	16000
S106	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE1-PIS1	16000
S107	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE1-PIS2	16000
S108	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE1-PIS3	16000
S109	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE1-PIS4	16000
S110	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE1-PIS5	16000
S111	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure	Preventive	AE1-PIS6	16000

	Piston Pin			
S112	1. Retightening Connecting rod	Preventive	AE1-COR1	8000
S113	1. Retightening Connecting rod	Preventive	AE1-COR2	8000
S114	1. Retightening Connecting rod	Preventive	AE1-COR3	8000
S115	1. Retightening Connecting rod	Preventive	AE1-COR4	8000
S116	1. Retightening Connecting rod	Preventive	AE1-COR5	8000
S117	1. Retightening Connecting rod	Preventive	AE1-COR6	8000
S118	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE1-COR1	16000
S119	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE1-COR2	16000
S120	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE1-COR3	16000
S121	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE1-COR4	16000

S122	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE1-COR5	16000
S123	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE1-COR6	16000
S124	1. Clean up, check and measure inner diameter	Preventive	AE1-CYL1	16000
S125	1. Clean up, check and measure inner diameter	Preventive	AE1-CYL2	16000
S126	1. Clean up, check and measure inner diameter	Preventive	AE1-CYL3	16000
S127	1. Clean up, check and measure inner diameter	Preventive	AE1-CYL4	16000
S128	1. Clean up, check and measure inner diameter	Preventive	AE1-CYL5	16000
S129	1. Clean up, check and measure inner diameter	Preventive	AE1-CYL6	16000
S130	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE1-CYL1	32000
S131	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE1-CYL2	32000
S132	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE1-CYL3	32000
S133	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE1-CYL4	32000
S134	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE1-CYL5	32000

S135	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE1-CYL6	32000
S136	1. Check main bearing alignment	Preventive	AE1-CRS1	8000
S137	1. Check main bearing alignment	Preventive	AE1-CRS2	8000
S138	1. Check main bearing alignment	Preventive	AE1-CRS3	8000
S139	1. Check main bearing alignment	Preventive	AE1-CRS4	8000
S140	1. Check main bearing alignment	Preventive	AE1-CRS5	8000
S141	1. Check main bearing alignment	Preventive	AE1-CRS6	8000
S142	1. Check condition vibration damper	Preventive	AE1-CRS1	16000
S143	1. Check condition vibration damper	Preventive	AE1-CRS2	16000
S144	1. Check condition vibration damper	Preventive	AE1-CRS3	16000
S145	1. Check condition vibration damper	Preventive	AE1-CRS4	16000
S146	1. Check condition vibration damper	Preventive	AE1-CRS5	16000
S147	1. Check condition vibration damper	Preventive	AE1-CRS6	16000
S148	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE1-MBE1	8000
S149	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE1-MBE2	8000
S150	1. Inspection guide bearing 2. Retightening main and	Preventive	AE1-MBE3	8000

	guide bearing cap			
S151	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE1-MBE4	8000
S152	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE1-MBE5	8000
S153	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE1-MBE6	8000
S154	1. Inspection main bearing	Preventive	AE1-MBE1	32000
S155	1. Inspection main bearing	Preventive	AE1-MBE2	32000
S156	1. Inspection main bearing	Preventive	AE1-MBE3	32000
S157	1. Inspection main bearing	Preventive	AE1-MBE4	32000
S158	1. Inspection main bearing	Preventive	AE1-MBE5	32000
S159	1. Inspection main bearing	Preventive	AE1-MBE6	32000
S160	1. Inspection gear wheel, bolt, connection 2. Inspection camshaft bearing clearance 3. Check camshaft adjustmen condition 4. Check lubrication of camshaft bearing	Preventive	AE1-CAS	16000
S161	1. Check oil level	Preventive	AE1-GOV	32000
S162	1. Open and clean up	Preventive	AE1-TCH	5000
S163	1. Check bearing	Preventive	AE1-TCH	10000

	Clearance			
S164	1. Check Injection timing	Preventive	AE1-FOS-FIP	2000
S165	1. Overhaul include injection pump drive and coupling	Preventive	AE1-FOS-FIP	16000
S166	1. Open and check	Preventive	AE1-FOS-FFP	5000
S167	1. Renew filter	Preventive	AE1-FOC-FOF	250
S168	1. Replace	Preventive	AE1-LOS-LO	250
S169	1. Open, clean up, check, hydraulic test	Preventive	AE1-LOS-LOC	10000
S170	1. Open, clean up and check	Preventive	AE1-LOS-THV	5000
S171	1. Open, clean up, check and measure	Preventive	AE1-LOS-LOP	10000
S172	1. Renew filter	Preventive	AE1-LOS-LOF	500
S173	1. Open, clean up and check	Preventive	AE1-CWS-THV	2500
S174	1. Open, clean up and measure	Preventive	AE1-CWS-CWP	10000
S175	1. Clean intercooler	Preventive	AE1-CWS-INT	10000
S176	1. Adjustment, of opening pressure	Preventive	AE2-INJ1	2000
S177	1. Adjustment, of opening pressure	Preventive	AE2-INJ2	2000
S178	1. Adjustment, of opening pressure	Preventive	AE2-INJ3	2000
S179	1. Adjustment, of opening pressure	Preventive	AE2-INJ4	2000
S180	1. Adjustment, of opening pressure	Preventive	AE2-INJ5	2000
S181	1. Adjustment, of opening	Preventive	AE2-INJ6	2000

	pressure			
S182	1. Retightening Cylinder head bolt	Preventive	AE2-CYH1	200
S183	1. Retightening Cylinder head bolt	Preventive	AE2-CYH2	200
S184	1. Retightening Cylinder head bolt	Preventive	AE2-CYH3	200
S185	1. Retightening Cylinder head bolt	Preventive	AE2-CYH4	200
S186	1. Retightening Cylinder head bolt	Preventive	AE2-CYH5	200
S187	1. Retightening Cylinder head bolt	Preventive	AE2-CYH6	200
S188	1. Open and check Valve Rotator	Preventive	AE2-CYH1	2000
S189	1. Open and check Valve Rotator	Preventive	AE2-CYH2	2000
S190	1. Open and check Valve Rotator	Preventive	AE2-CYH3	2000
S191	1. Open and check Valve Rotator	Preventive	AE2-CYH4	2000
S192	1. Open and check Valve Rotator	Preventive	AE2-CYH5	2000
S193	1. Open and check Valve Rotator	Preventive	AE2-CYH6	2000
S194	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE2-CYH1	16000

S195	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE2-CYH2	16000
S196	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE2-CYH3	16000
S197	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE2-CYH4	16000
S198	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder	Preventive	AE2-CYH5	16000

	head cooling water space			
S199	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE2-CYH6	16000
S200	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE2-PIS1	16000
S201	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE2-PIS2	16000
S202	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE2-PIS3	16000
S203	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE2-PIS4	16000

S204	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE2-PIS5	16000
S205	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE2-PIS6	16000
S206	1. Retightening Connecting rod	Preventive	AE2-COR1	8000
S207	1. Retightening Connecting rod	Preventive	AE2-COR2	8000
S208	1. Retightening Connecting rod	Preventive	AE2-COR3	8000
S209	1. Retightening Connecting rod	Preventive	AE2-COR4	8000
S210	1. Retightening Connecting rod	Preventive	AE2-COR5	8000
S211	1. Retightening Connecting rod	Preventive	AE2-COR6	8000
S212	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE2-COR1	16000
S213	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE2-COR2	16000
S214	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE2-COR3	16000

S215	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE2-COR4	16000
S216	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE2-COR5	16000
S217	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE2-COR6	16000
S218	1. Clean up, check and measure inner diameter	Preventive	AE2-CYL1	16000
S219	1. Clean up, check and measure inner diameter	Preventive	AE2-CYL2	16000
S220	1. Clean up, check and measure inner diameter	Preventive	AE2-CYL3	16000
S221	1. Clean up, check and measure inner diameter	Preventive	AE2-CYL4	16000
S222	1. Clean up, check and measure inner diameter	Preventive	AE2-CYL5	16000
S223	1. Clean up, check and measure inner diameter	Preventive	AE2-CYL6	16000
S224	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE2-CYL1	32000
S225	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE2-CYL2	32000
S226	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE2-CYL3	32000
S227	1. Remove cylinder liner, check water space and	Preventive	AE2-CYL4	32000

	wear ring in frame			
S228	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE2-CYL5	32000
S229	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE2-CYL6	32000
S230	1. Check main bearing alignment	Preventive	AE2-CRS1	8000
S231	1. Check main bearing alignment	Preventive	AE2-CRS2	8000
S232	1. Check main bearing alignment	Preventive	AE2-CRS3	8000
S233	1. Check main bearing alignment	Preventive	AE2-CRS4	8000
S234	1. Check main bearing alignment	Preventive	AE2-CRS5	8000
S235	1. Check main bearing alignment	Preventive	AE2-CRS6	8000
S236	1. Check condition vibration damper	Preventive	AE2-CRS1	16000
S237	1. Check condition vibration damper	Preventive	AE2-CRS2	16000
S238	1. Check condition vibration damper	Preventive	AE2-CRS3	16000
S239	1. Check condition vibration damper	Preventive	AE2-CRS4	16000
S240	1. Check condition vibration damper	Preventive	AE2-CRS5	16000
S241	1. Check condition vibration damper	Preventive	AE2-CRS6	16000
S242	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE2-MBE1	8000

S243	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE2-MBE2	8000
S244	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE2-MBE3	8000
S245	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE2-MBE4	8000
S246	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE2-MBE5	8000
S247	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE2-MBE6	8000
S248	1. Inspection main bearing	Preventive	AE2-MBE1	32000
S249	1. Inspection main bearing	Preventive	AE2-MBE2	32000
S250	1. Inspection main bearing	Preventive	AE2-MBE3	32000
S251	1. Inspection main bearing	Preventive	AE2-MBE4	32000
S252	1. Inspection main bearing	Preventive	AE2-MBE5	32000
S253	1. Inspection main bearing	Preventive	AE2-MBE6	32000
S254	1. Inspection gear wheel, bolt, connection 2. Inspection camshaft bearing clearance 3. Check camshaft adjustmen condition	Preventive	AE2-CAS	16000

	4. Check lubrication of camshaft bearing			
S255	1. Check oil level	Preventive	AE2-GOV	32000
S256	1. Open and clean up	Preventive	AE2-TCH	5000
S257	1. Check bearing Clearance	Preventive	AE2-TCH	10000
S258	1. Check Injection timing	Preventive	AE2-FOS-FIP	2000
S259	1. Overhaul include injection pump drive and coupling	Preventive	AE2-FOS-FIP	16000
S260	1. Open and check	Preventive	AE2-FOS-FFP	5000
S261	1. Renew filter	Preventive	AE2-FOC-FOF	250
S262	1. Replace	Preventive	AE2-LOS-LO	250
S263	1. Open, clean up, check, hydraulic test	Preventive	AE2-LOS-LOC	10000
S264	1. Open, clean up and check	Preventive	AE2-LOS-THV	5000
S265	1. Open, clean up, check and measure	Preventive	AE2-LOS-LOP	10000
S266	1. Renew filter	Preventive	AE2-LOS-LOF	500
S267	1. Open, clean up and check	Preventive	AE2-CWS-THV	2500
S268	1. Open, clean up and measure	Preventive	AE2-CWS-CWP	10000
S269	1. Clean intercooler	Preventive	AE2-CWS-INT	10000
S270	1. Adjustment, of opening pressure	Preventive	AE3-INJ1	2000

S271	1. Adjustment, of opening pressure	Preventive	AE3-INJ2	2000
S272	1. Adjustment, of opening pressure	Preventive	AE3-INJ3	2000
S273	1. Adjustment, of opening pressure	Preventive	AE3-INJ4	2000
S274	1. Adjustment, of opening pressure	Preventive	AE3-INJ5	2000
S275	1. Adjustment, of opening pressure	Preventive	AE3-INJ6	2000
S276	1. Retightening Cylinder head bolt	Preventive	AE3-CYH1	200
S277	1. Retightening Cylinder head bolt	Preventive	AE3-CYH2	200
S278	1. Retightening Cylinder head bolt	Preventive	AE3-CYH3	200
S279	1. Retightening Cylinder head bolt	Preventive	AE3-CYH4	200
S280	1. Retightening Cylinder head bolt	Preventive	AE3-CYH5	200
S281	1. Retightening Cylinder head bolt	Preventive	AE3-CYH6	200
S282	1. Open and check Valve Rotator	Preventive	AE3-CYH1	2000
S283	1. Open and check Valve Rotator	Preventive	AE3-CYH2	2000
S284	1. Open and check Valve Rotator	Preventive	AE3-CYH3	2000
S285	1. Open and check Valve Rotator	Preventive	AE3-CYH4	2000
S286	1. Open and check Valve Rotator	Preventive	AE3-CYH5	2000
S287	1. Open and check Valve Rotator	Preventive	AE3-CYH6	2000

S288	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE3-CYH1	16000
S289	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE3-CYH2	16000
S290	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE3-CYH3	16000
S291	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder	Preventive	AE3-CYH4	16000

	head cooling water space			
S292	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE3-CYH5	16000
S293	1. Inlet and Exhaust Valve - Overhaul and regrinding of spindel and valve seat 2. Inspection Inlet, Exhaust Valve and Valve Guide 3. Sleeve for fuel injector 4. Inspection cylinder head cooling water space	Preventive	AE3-CYH6	16000
S294	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE3-PIS1	16000
S295	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE3-PIS2	16000

S296	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE3-PIS3	16000
S297	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE3-PIS4	16000
S298	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE3-PIS5	16000
S299	1. Inspection of Piston 2. Check and measure Piston Rings 3. Check and measure Piston Pin	Preventive	AE3-PIS6	16000
S300	1. Retightening Connecting rod	Preventive	AE3-COR1	8000
S301	1. Retightening Connecting rod	Preventive	AE3-COR2	8000
S302	1. Retightening Connecting rod	Preventive	AE3-COR3	8000
S303	1. Retightening Connecting rod	Preventive	AE3-COR4	8000
S304	1. Retightening Connecting rod	Preventive	AE3-COR5	8000
S305	1. Retightening Connecting rod	Preventive	AE3-COR6	8000
S306	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE3-COR1	16000

S307	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE3-COR2	16000
S308	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE3-COR3	16000
S309	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE3-COR4	16000
S310	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE3-COR5	16000
S311	1. Check clearance piston pin and bush 2. Measuring big-end bore 3. Renew bearing	Preventive	AE3-COR6	16000
S312	1. Clean up, check and measure inner diameter	Preventive	AE3-CYL1	16000
S313	1. Clean up, check and measure inner diameter	Preventive	AE3-CYL2	16000
S314	1. Clean up, check and measure inner diameter	Preventive	AE3-CYL3	16000
S315	1. Clean up, check and measure inner diameter	Preventive	AE3-CYL4	16000
S316	1. Clean up, check and measure inner diameter	Preventive	AE3-CYL5	16000
S317	1. Clean up, check and measure inner diameter	Preventive	AE3-CYL6	16000

S318	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE3-CYL1	32000
S319	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE3-CYL2	32000
S320	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE3-CYL3	32000
S321	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE3-CYL4	32000
S322	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE3-CYL5	32000
S323	1. Remove cylinder liner, check water space and wear ring in frame	Preventive	AE3-CYL6	32000
S324	1. Check main bearing alignment	Preventive	AE3-CRS1	8000
S325	1. Check main bearing alignment	Preventive	AE3-CRS2	8000
S326	1. Check main bearing alignment	Preventive	AE3-CRS3	8000
S327	1. Check main bearing alignment	Preventive	AE3-CRS4	8000
S328	1. Check main bearing alignment	Preventive	AE3-CRS5	8000
S329	1. Check main bearing alignment	Preventive	AE3-CRS6	8000
S330	1. Check condition vibration damper	Preventive	AE3-CRS1	16000
S331	1. Check condition vibration damper	Preventive	AE3-CRS2	16000
S332	1. Check condition vibration damper	Preventive	AE3-CRS3	16000
S333	1. Check condition vibration damper	Preventive	AE3-CRS4	16000

S334	1. Check condition vibration damper	Preventive	AE3-CRS5	16000
S335	1. Check condition vibration damper	Preventive	AE3-CRS6	16000
S336	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE3-MBE1	8000
S337	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE3-MBE2	8000
S338	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE3-MBE3	8000
S339	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE3-MBE4	8000
S340	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE3-MBE5	8000
S341	1. Inspection guide bearing 2. Retightening main and guide bearing cap	Preventive	AE3-MBE6	8000
S342	1. Inspection main bearing	Preventive	AE3-MBE1	32000
S343	1. Inspection main bearing	Preventive	AE3-MBE2	32000
S344	1. Inspection main bearing	Preventive	AE3-MBE3	32000
S345	1. Inspection main bearing	Preventive	AE3-MBE4	32000
S346	1. Inspection main bearing	Preventive	AE3-MBE5	32000

S347	1. Inspection main bearing	Preventive	AE3-MBE6	32000
S348	1. Inspection gear wheel, bolt, connection 2. Inspection camshaft bearing clearance 3. Check camshaft adjustmen condition 4. Check lubrication of camshaft bearing	Preventive	AE3-CAS	16000
S349	1. Check oil level	Preventive	AE3-GOV	32000
S350	1. Open and clean up	Preventive	AE3-TCH	5000
S351	1. Check bearing Clearance	Preventive	AE3-TCH	10000
S352	1. Check Injection timing	Preventive	AE3-FOS-FIP	2000
S353	1. Overhaul include injection pump drive and coupling	Preventive	AE3-FOS-FIP	16000
S354	1. Open and check	Preventive	AE3-FOS-FFP	5000
S355	1. Renew filter	Preventive	AE3-FOC-FOF	250
S356	1. Replace	Preventive	AE3-LOS-LO	250
S357	1. Open, clean up, check, hydraulic test	Preventive	AE3-LOS-LOC	10000
S358	1. Open, clean up and check	Preventive	AE3-LOS-THV	5000
S359	1. Open, clean up, check and measure	Preventive	AE3-LOS-LOP	10000
S360	1. Renew filter	Preventive	AE3-LOS-LOF	500
S361	1. Open, clean up and check	Preventive	AE3-CWS-THV	2500
S362	1. Open, clean up and measure	Preventive	AE3-CWS-CWP	10000

S363	1. Clean intercooler	Preventive	AE3-CWS-INT	10000

Enclosure 4. Database Schema

1. Input

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
Number	Int (5)		No		Auto_increment			
Item_Code	Varchar (20)		No			item. itemcode ON UPDATECASCADE ON DELETE CASCADE		
Work_Hour	Int (10)		Yes	NULL				
Status	varchar (10)		No					
Note	Text		Yes	NULL				

1. Input (continued)

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
Date	Datetime		No	CURRENT_TIMESTAMP	On update CURRENT_TIMESTAMP			
Schedulreno	Varchar (6)		No			schedule. SchNumber ON UPDATE CASCADE ON DELETE CASCADE		
Frequency	Int (10)		No					

2. Item

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
Itemcode	Varchar (50)		No					
Itemname	Varchar (50)		No					
Class	Varchar (50)		No					
System	Varchar (50)		No					

3. Login ID

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
Username	Varcr (10)		No					
Password	Varcr (10)		No					

4. Maintenance Record

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
Number	Int (5)		No		auto_ increment			
Itemcode	Varchar (20)		No			item. Itemcode ON UPDATE CASCADE ON DELETE CASCADE		
BreakdownTime	Int (20)		No					
Description	Varchar (500)		No					
Date	Datetime		No	CURRENT _TIMESTAMP				

5. Risk

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
Number	Int (11)		No	auto_increment				
ScheduleNumber	Varchar (5)					schedule. SchNumber ON UPDATE CASCADE ON DELETE CASCADE		
Activity	Varchar (1000)							
Itemname	Varchar (20)							
Happen	Varchar (100)							
Cause	Varchar (100)							
Consequence	Varchar (100)							
Likelihood	Varchar (50)							
Level	Varchar (50)							

6. Schedule

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
SchNumber	Varchar (20)		No					
PMactivit	Varchar (500)		No					
Type	Varchar (10)		No					
Itemcode	Varchar (20)		No			item. Itemcode ON UPDATE CASCADE ON DELETE CASCADE		
Frequency	Int (3)		No					
Timetype	Varchar (10)		No					

7. Spareparts

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
SPNumber	Varchar (20)		No					
Itemname	Varchar (20)		No					
Itemcode	Varchar (20)		No	item. Itemcode ON UPDATE CASCADE ON DELETE CASCADE				
Sparepart	Varchar (20)		No					
Quantity	Int (5)		No					

8. Voyage

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
Number	Int (11)		No					
Origin	Varchar (100)		No					
ETD	Date		No					
Destination	Varchar (100)		No					
ETA	date		No					

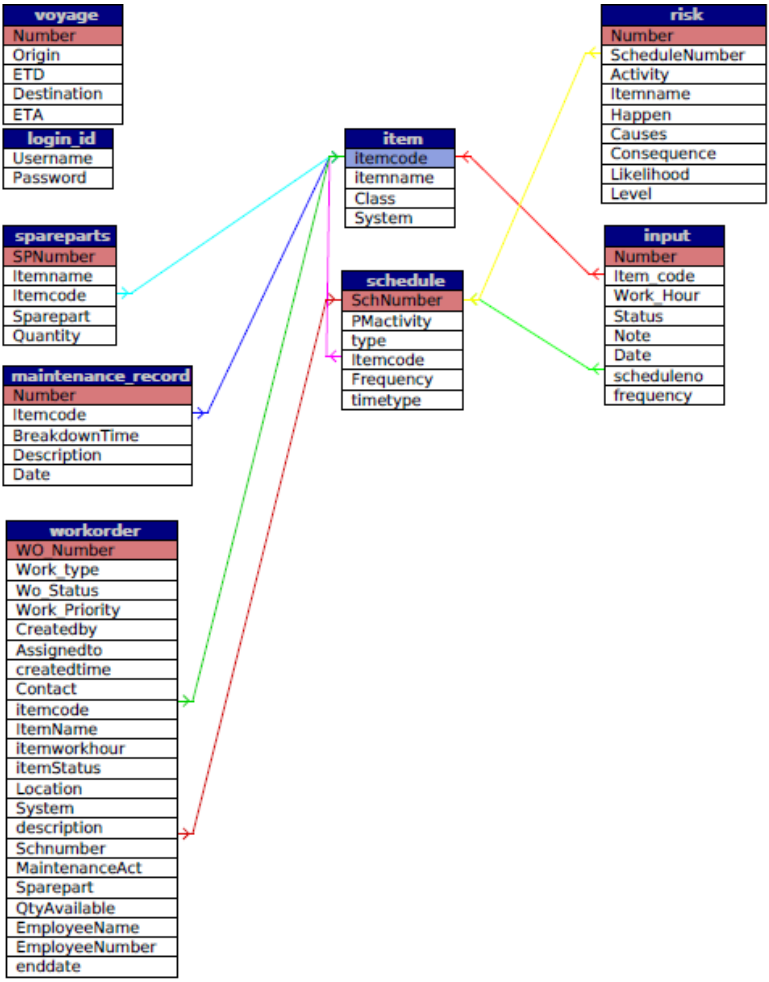
9. Work Order

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
WO_Number	Varchar (20)		No					
Work_type	Varchar (20)		No					
Wo_status	Varchar (10)		No					
Work_priority	Varchar (20)		No					
Createdby	Varchar (20)		No					
Assignedto	Varchar (20)		No					
Createdtime	datetime		No	CURRENT_ TIMESTAMP				
Contact	Varchar (20)		No					
Itemcode	Varchar (20)		No			item. Itemcode ON UPDATE CASCADE ON DELETE CASCADE		
Itemname	Varchar (20)		No					
Itemworkhour	Int (20)		No					

9. Work Order (Continued)

Column	Type	Attributes	Null	Default	Extra	Links to	Comments	MMIE
ItemStatus	Varchar (20)		No					
Location	Varchar (20)		No					
System	Varchar (20)		No					
Description	text		No					
Schnumber	Varchar (20)		No			schedule. SchNumber ON UPDATE CASCADE ON DELETE CASCADE		
MaintenanceAct	Varchar (500)		No					
Sparepart	Varchar (500)		No					
QtyAvailable	Int (10)		No					
Employeename	Varchar (20)		No					
Employeenumber	Int (20)		No					
Enddate	datetime		No	CURRENT_TIMESTAMP				

10. Relation Schema



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Enclosure 5. Web Script

Enclosure 5.1 Login Page

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
mysql_select_db($database_maintenance, $maintenance);
$query_Login = "SELECT * FROM login_id";
$Login = mysql_query($query_Login, $maintenance) or
die(mysql_error());
$row_Login = mysql_fetch_assoc($Login);
$totalRows_Login = mysql_num_rows($Login);
?><?php
// *** Validate request to login to this site.
if (!isset($_SESSION)) {
  session_start();
}

$loginFormAction = $_SERVER['PHP_SELF'];
if (isset($_GET['accesscheck'])) {
  $_SESSION['PrevUrl'] = $_GET['accesscheck'];
}

if (isset($_POST['Username'])) {
  $loginUsername=$_POST['Username'];
  $password=$_POST['Password'];
  $MM_fldUserAuthorization = "";
  $MM_redirectLoginSuccess = "Mainmenu.php";
  $MM_redirectLoginFailed = "Login_failed.php";
  $MM_redirecttoReferrer = false;
  mysql_select_db($database_maintenance, $maintenance);

  $LoginRS__query=sprintf("SELECT Username, Password
FROM login_id WHERE Username='%s' AND Password='%s'",
    get_magic_quotes_gpc() ? $loginUsername :
addslashes($loginUsername), get_magic_quotes_gpc() ?
$password : addslashes($password));

  $LoginRS = mysql_query($LoginRS__query, $maintenance) or
```

```
die(mysql_error());
  $loginFoundUser = mysql_num_rows($LoginRS);
  if ($loginFoundUser) {
     $loginStrGroup = "";

    //declare two session variables and assign them
    $_SESSION['MM_Username'] = $loginUsername;
    $_SESSION['MM_UserGroup'] = $loginStrGroup;

    if (isset($_SESSION['PrevUrl']) && false) {
      $MM_redirectLoginSuccess = $_SESSION['PrevUrl'];
    }
    header("Location: " . $MM_redirectLoginSuccess );
  }
  else {
    header("Location: ". $MM_redirectLoginFailed );
  }
}
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0
Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-
transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html;
charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {
        font-size: 36px;
        font-variant: normal;
        font-family: Calibri, "Calibri Light";
        font-style: normal;
        text-decoration: none;
        font-stretch: normal;
```

```
        marker-offset: auto;
        cursor: crosshair;
}
.style2 {
        font-family: "Cooper Black";
        color: #FFFFFF;
}
-->
</style>
</head>

<body>
<table width="767" border="0" align="center">
  <tr>
    <td width="757"><div align="center"
class="style1">Maintenance Management </div></td>
  </tr>
</table>
<hr />
<table width="282" border="0" align="center">
  <tr>
    <td width="272"><form id="form1" name="form1"
method="POST" action="<?php echo $loginFormAction; ?>">
      <table width="309" border="0">
        <tr bgcolor="#00FF99">
          <td colspan="2" bgcolor="#00FF99"><div align="center"
class="style2">Login</div></td>
        </tr>
        <tr>
          <td width="74">Username</td>
          <td width="219"><label>
            <input name="Username" type="text" id="Username" />
          </label></td>
        </tr>
        <tr>
```

```
        <td>Password</td>
        <td><label>
          <input name="Password" type="password"
id="Password" />
        </label></td>
       </tr>
       <tr>
        <td> </td>
        <td><label>
          <input type="submit" name="Submit" value="Login" />
        </label></td>
       </tr>
     </table>
   </form></td>
  </tr>
</table>
</body>

</html>
<?php
mysql_free_result($Login);
?>
```

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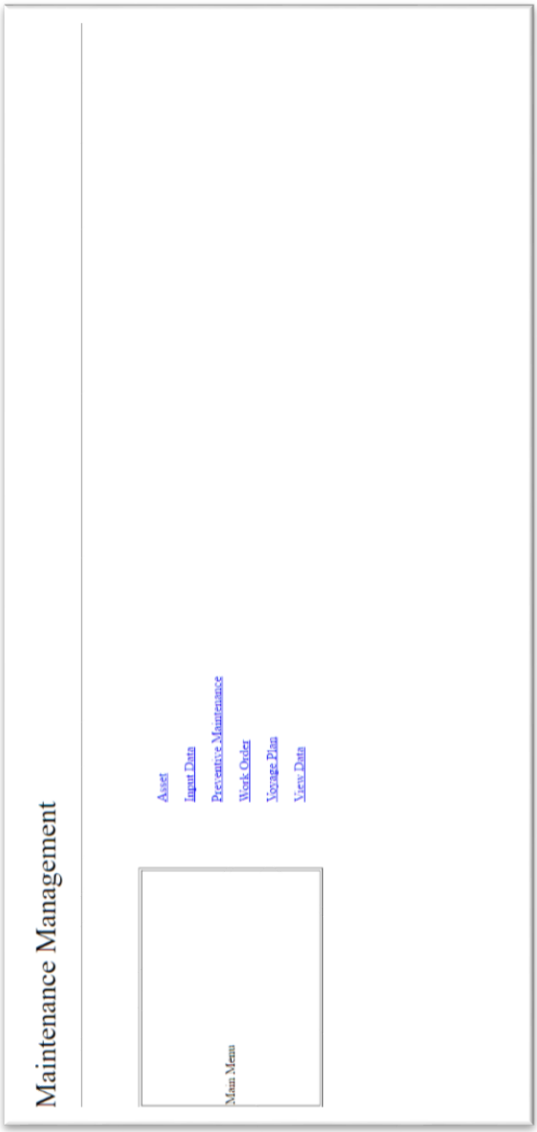
Enclosure 5.2 Main Menu



```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<hr />
<p> </p>
<table width="1029" height="264" border="0">
  <tr>
    <td width="305"><table width="301" border="1">
        <tr>
          <td width="291" height="218">Main Menu </td>
        </tr>
      </table></td>
```

```
    <td width="69" height="260"> </td>
    <td width="641">
          <div id="globalNav">
   <p><a href="Asset.php">Asset</a></p>
   <p><a href="Input.php">Input Data</a></p>
   <p><a href="Planning.php">Preventive Maintenance </a></p>
   <p><a href="Work_order.php">Work Order</a></p>
   <p><a href="Voyage.php">Voyage Plan </a></p>
   <p><a href="Data.php">View Data</a></p>
          </div></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
```

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Enclosure 5.3 Asset

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
function GetSQLValueString($theValue, $theType,
$theDefinedValue = "", $theNotDefinedValue = "")
{
 $theValue = (!get_magic_quotes_gpc()) ?
addslashes($theValue) : $theValue;

  switch ($theType) {
    case "text":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" :
"NULL";
      break;
    case "long":
    case "int":
      $theValue = ($theValue != "") ? intval($theValue) : "NULL";
      break;
    case "double":
      $theValue = ($theValue != "") ? "'" . doubleval($theValue) .
"'" : "NULL";
      break;
    case "date":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" :
"NULL";
      break;
    case "defined":
      $theValue = ($theValue != "") ? $theDefinedValue :
$theNotDefinedValue;
      break;
  }
  return $theValue;
}

$editFormAction = $_SERVER['PHP_SELF'];
if (isset($_SERVER['QUERY_STRING'])) {
```

```
 $editFormAction .= "?" . htmlentities($_SERVER['QUERY_STRING']);
}

if ((isset($_POST["MM_insert"])) && ($_POST["MM_insert"] == "form1")) {
 $insertSQL = sprintf("INSERT INTO item (itemcode, itemname, `Class`, System) VALUES (%s, %s, %s, %s)",
                GetSQLValueString($_POST['itemcode'], "text"),
                GetSQLValueString($_POST['itemname'], "text"),
                GetSQLValueString($_POST['Class'], "text"),
                GetSQLValueString($_POST['System'], "text"));

 mysql_select_db($database_maintenance, $maintenance);
 $Result1 = mysql_query($insertSQL, $maintenance) or die(mysql_error());
}

if ((isset($_POST["MM_insert"])) && ($_POST["MM_insert"] == "form2")) {
 $insertSQL = sprintf("INSERT INTO spareparts (SPNumber, Itemname, Itemcode, Sparepart, Quantity) VALUES (%s, %s, %s, %s, %s)",
                GetSQLValueString($_POST['SPNumber'], "text"),
                GetSQLValueString($_POST['Itemname'], "text"),
                GetSQLValueString($_POST['Itemcode'], "text"),
                GetSQLValueString($_POST['Sparepart'], "text"),
                GetSQLValueString($_POST['Quantity'], "int"));

 mysql_select_db($database_maintenance, $maintenance);
 $Result1 = mysql_query($insertSQL, $maintenance) or die(mysql_error());
}
mysql_select_db($database_maintenance, $maintenance);
$query_itemlist = "SELECT * FROM item";
```

```
$itemlist = mysql_query($query_itemlist, $maintenance) or die(mysql_error());
$row_itemlist = mysql_fetch_assoc($itemlist);
$totalRows_itemlist = mysql_num_rows($itemlist);

mysql_select_db($database_maintenance, $maintenance);
$query_Sparepart = "SELECT * FROM spareparts";
$Sparepart = mysql_query($query_Sparepart, $maintenance) or die(mysql_error());
$row_Sparepart = mysql_fetch_assoc($Sparepart);
$totalRows_Sparepart = mysql_num_rows($Sparepart);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style2 {color: #FF0000}
-->
</style>
</head>

<body>
<div id="Title">
  <h1>Maintenance Management
  </h1>
  <h2>SHIPS </h2>
  <hr />

  <a href="Mainmenu.php">Home</a> | <a
```

```
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> |<a
href="Voyage.php">Voyage Plan</a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></div>
<table width="1093" height="271" border="0">
  <tr>
    <td width="288">Asset</td>
    <td width="44" height="267"> </td>
    <td width="391"><p>Asset input
      </p>
     <form method="post" name="form1" action="<?php echo
$editFormAction; ?>">
       <table align="left">
         <tr valign="baseline">
           <td nowrap align="right">Itemcode:</td>
           <td><input type="text" name="itemcode"
size="20"></td>
         </tr>
         <tr valign="baseline">
           <td nowrap align="right">Itemname:</td>
           <td><input type="text" name="itemname" value=""
size="20"></td>
         </tr>
         <tr valign="baseline">
           <td nowrap align="right">Class:</td>
           <td><input type="text" name="Class" value=""
size="20"></td>
         </tr>
         <tr valign="baseline">
           <td nowrap align="right">System:</td>
           <td><input type="text" name="System" value=""
size="20"></td>
         </tr>
         <tr valign="baseline">
```

```
          <td nowrap align="right"> </td>
          <td><input type="submit" value="Insert"></td>
        </tr>
      </table>
      <input type="hidden" name="MM_insert" value="form1">
    </form>
   <p> </p></td>
   <td width="352"><p>Sparepart input</p>
    <form method="post" name="form2" action="<?php echo
$editFormAction; ?>">
     <table align="left">
       <tr valign="baseline">
         <td nowrap align="right">SP Number:</td>
         <td><input name="SPNumber" type="text" value=""
size="8" /></td>
       </tr>
       <tr valign="baseline">
         <td nowrap align="right">Itemname:</td>
         <td><input type="text" name="Itemname" value=""
size="20"></td>
       </tr>
       <tr valign="baseline">
         <td nowrap align="right">Itemcode:</td>
         <td><select name="Itemcode">
             <?php
do {
?>
             <option value="<?php echo
$row_itemlist['itemcode']?>" ><?php echo
$row_itemlist['itemcode']?></option>
             <?php
} while ($row_itemlist = mysql_fetch_assoc($itemlist));
?>
           </select>
         </td>
```

```
        <tr>
        <tr valign="baseline">
          <td nowrap align="right">Sparepart:</td>
          <td><textarea                              name="Sparepart"
cols="20"></textarea></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right">Quantity:</td>
          <td><input     type="text"     name="Quantity"     value=""
size="8"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"> </td>
          <td><input type="submit" value="Insert"></td>
        </tr>
      </table>
      <input type="hidden" name="MM_insert" value="form2">
    </form>
    <p> </p>
    <p> </p>
   <p> </p></td>
  </tr>
</table>
<p align="right"> </p>
</body>

</html>
<?php
mysql_free_result($itemlist);
?>
```

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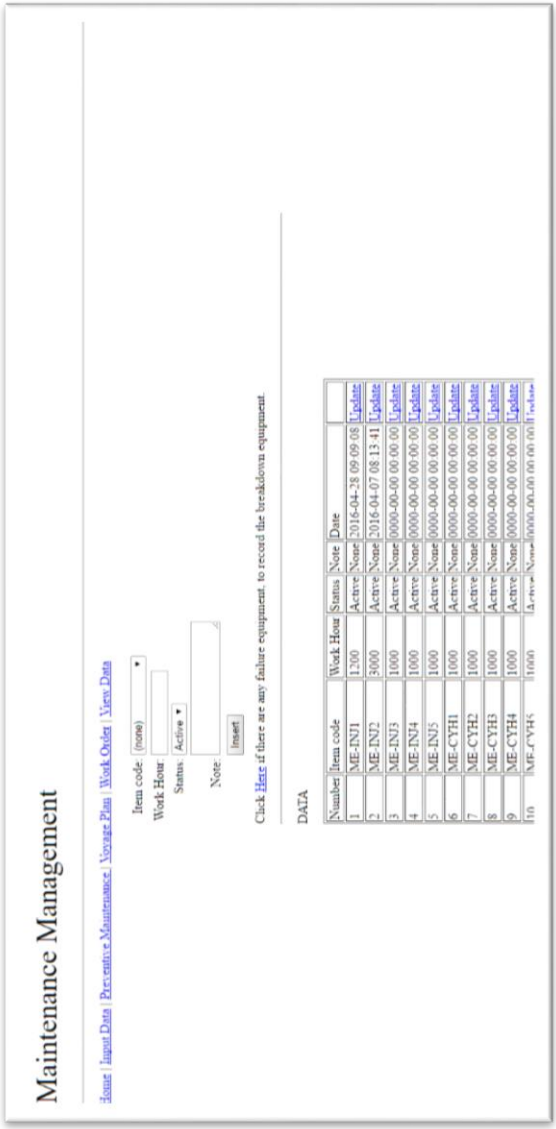
Enclosure 5.4 Input page



Maintenance Management

Home | Input Data | Preventive Maintenance | Voyage Plan | Work Order | View Data

Item code: (none)

Work Hour:

Status: Active

Note:

Insert

Click Here if there are any failure equipment to record the breakdown equipment

DATA

Number	Item code	Work Hour	Status	Note	Date	
1	ME-IN1	1200	Active	None	2016-04-28 09:09:08	Update
2	ME-IN2	3000	Active	None	2016-04-07 08:13:41	Update
3	ME-IN3	1000	Active	None	0000-00-00 00:00:00	Update
4	ME-IN4	1000	Active	None	0000-00-00 00:00:00	Update
5	ME-IN5	1000	Active	None	0000-00-00 00:00:00	Update
6	ME-CYH1	1000	Active	None	0000-00-00 00:00:00	Update
7	ME-CYH2	1000	Active	None	0000-00-00 00:00:00	Update
8	ME-CYH3	1000	Active	None	0000-00-00 00:00:00	Update
9	ME-CYH4	1000	Active	None	0000-00-00 00:00:00	Update
10	ME-CYH5	1000	Active	None	0000-00-00 00:00:00	Update

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
function GetSQLValueString($theValue, $theType, $theDefinedValue = "", $theNotDefinedValue = "")
{
  $theValue = (!get_magic_quotes_gpc()) ? addslashes($theValue) : $theValue;

  switch ($theType) {
    case "text":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
      break;
    case "long":
    case "int":
      $theValue = ($theValue != "") ? intval($theValue) : "NULL";
      break;
    case "double":
      $theValue = ($theValue != "") ? "'" . doubleval($theValue) . "'" : "NULL";
      break;
    case "date":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
      break;
    case "defined":
      $theValue = ($theValue != "") ? $theDefinedValue : $theNotDefinedValue;
      break;
  }
  return $theValue;
}

$editFormAction = $_SERVER['PHP_SELF'];
if (isset($_SERVER['QUERY_STRING'])) {
```

```
 $editFormAction .= "?" . htmlentities($_SERVER['QUERY_STRING']);
}

if ((isset($_POST["MM_insert"])) && ($_POST["MM_insert"] == "form1")) {
 $insertSQL = sprintf("INSERT INTO input (Item_code, Work_Hour, Status, Note) VALUES (%s, %s, %s, %s)",
                GetSQLValueString($_POST['Item_code'], "text"),
                GetSQLValueString($_POST['Work_Hour'], "int"),
                GetSQLValueString($_POST['Status'], "text"),
                GetSQLValueString($_POST['Note'], "text"));

 mysql_select_db($database_maintenance, $maintenance);
 $Result1 = mysql_query($insertSQL, $maintenance) or die(mysql_error());
}

mysql_select_db($database_maintenance, $maintenance);
$query_input = "SELECT * FROM `input`";
$input = mysql_query($query_input, $maintenance) or die(mysql_error());
$row_input = mysql_fetch_assoc($input);
$totalRows_input = mysql_num_rows($input);

mysql_select_db($database_maintenance, $maintenance);
$query_item = "SELECT * FROM item";
$item = mysql_query($query_item, $maintenance) or die(mysql_error());
$row_item = mysql_fetch_assoc($item);
$totalRows_item = mysql_num_rows($item);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
```

```
<head>
<meta http-equiv="Content-Type" content="text/html;
charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> | <a
href="Voyage.php">Voyage Plan</a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1093" height="271" border="0">
  <tr>
    <td width="287">Input Data </td>
    <td width="46" height="267"> </td>
    <td width="746"><form method="post" name="form1"
```

```
action="<?php echo $editFormAction; ?>">
      <table align="left">
        <tr valign="baseline">
          <td nowrap align="right">Item code:</td>
          <td><select name="Item_code">
              <?php
do {
?>
              <option value="<?php echo $row_item['itemcode']?>"
><?php echo $row_item['itemcode']?></option>
              <?php
} while ($row_item = mysql_fetch_assoc($item));
?>
            </select>
          </td>
        <tr>
        <tr valign="baseline">
          <td nowrap align="right">Work Hour:</td>
          <td><input type="text" name="Work_Hour" value=""
size="10"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right">Status:</td>
          <td><select name="Status">
              <option value="Active" <?php if (!(strcmp("Active",
""))) {echo "SELECTED";} ?>>Active</option>
              <option value="Failure" <?php if (!(strcmp("Failure",
""))) {echo "SELECTED";} ?>>Failure</option>
            </select>
          </td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right">Note:</td>
          <td><textarea name="Note" cols="20"></textarea></td>
        </tr>
```

```
        <tr valign="baseline">
          <td nowrap align="right"> </td>
          <td><input type="submit" value="Insert"></td>
        </tr>
      </table>
      <input type="hidden" name="MM_insert" value="form1">
    </form>
    <p> </p>
    <p> </p>
    <p> </p>
    <p> </p>
    <p>Click <a href="Maintenance_record.php">Here</a> if there are any failure equipment, to record the breakdown equipment. </p>
    <hr />
    <p>DATA</p>
    <table border="1">
    <tr>
      <td>Number</td>
      <td>Item code</td>
      <td>Work Hour</td>
      <td>Status</td>
      <td>Note</td>
      <td>Date</td>
      <td> </td>
      </tr>
    <?php do { ?>
    <tr>
      <td><?php echo $row_input['Number']; ?></td>
      <td><?php echo $row_input['Item_code']; ?></td>
      <td><?php echo $row_input['Work_Hour']; ?></td>
      <td><?php echo $row_input['Status']; ?></td>
      <td><?php echo $row_input['Note']; ?></td>
      <td><?php echo $row_input['Date']; ?></td>
      <td><a href="Update_Input.php?Item_code=<?php echo
```

```
$row_input['Item_code']; ?>">Update</a></td>
        </tr>
      <?php } while ($row_input = mysql_fetch_assoc($input)); ?>
    </table></td>
  </tr>
</table>
<p> </p>
</body>
</html>
<?php
mysql_free_result($input);

mysql_free_result($item);
?>
```

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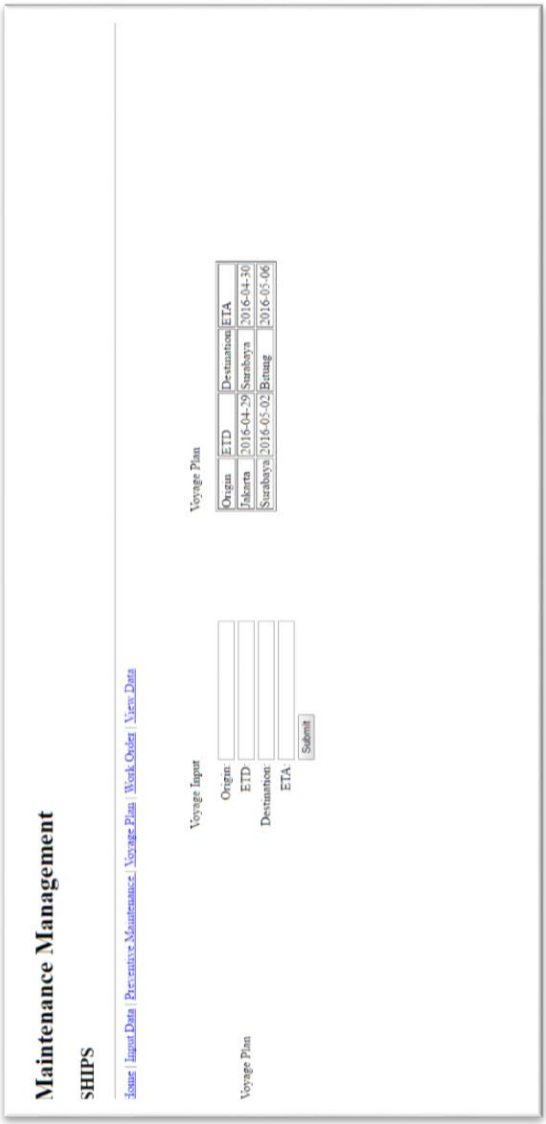
Enclosure 5.5 Voyage Plan



```
<?php require_once('Connections/maintenance.php'); ?>
<?php
function GetSQLValueString($theValue, $theType,
$theDefinedValue = "", $theNotDefinedValue = "")
{
 $theValue = (!get_magic_quotes_gpc()) ?
addslashes($theValue) : $theValue;

  switch ($theType) {
    case "text":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" :
"NULL";
      break;
    case "long":
    case "int":
      $theValue = ($theValue != "") ? intval($theValue) : "NULL";
      break;
    case "double":
      $theValue = ($theValue != "") ? "'" . doubleval($theValue) .
"'" : "NULL";
      break;
    case "date":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" :
"NULL";
      break;
    case "defined":
      $theValue = ($theValue != "") ? $theDefinedValue :
$theNotDefinedValue;
      break;
  }
  return $theValue;
}

$editFormAction = $_SERVER['PHP_SELF'];
if (isset($_SERVER['QUERY_STRING'])) {
```

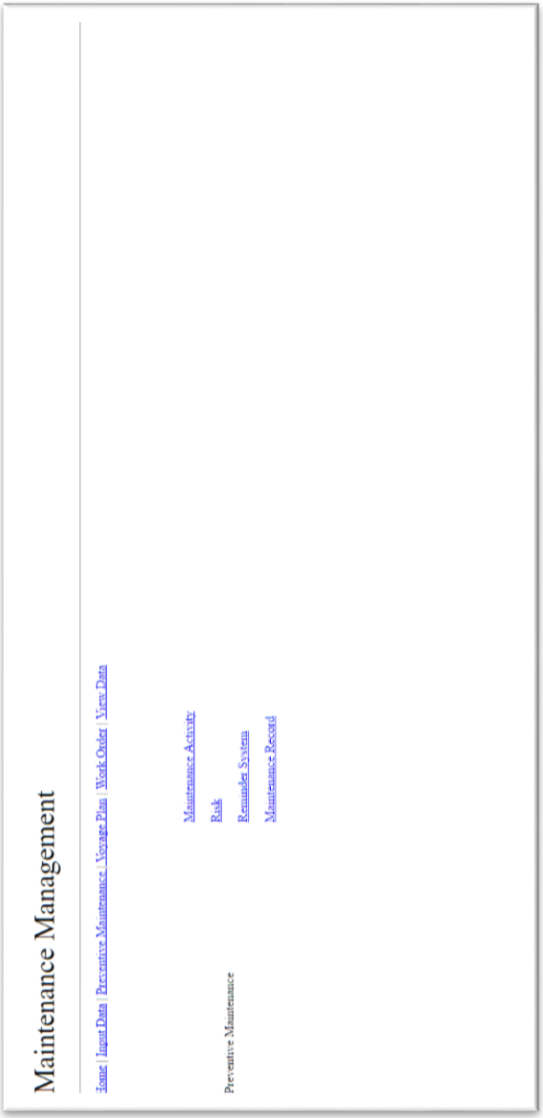
```
 $editFormAction .= "?" .
htmlentities($_SERVER['QUERY_STRING']);
}

if ((isset($_POST["MM_insert"])) && ($_POST["MM_insert"]
== "form1")) {
 $insertSQL = sprintf("INSERT INTO voyage (Origin, ETD,
Destination, ETA) VALUES (%s, %s, %s, %s)",
                GetSQLValueString($_POST['Origin'], "text"),
                GetSQLValueString($_POST['ETD'], "date"),
                GetSQLValueString($_POST['Destination'],
"text"),
                GetSQLValueString($_POST['ETA'], "date"));

 mysql_select_db($database_maintenance, $maintenance);
 $Result1 = mysql_query($insertSQL, $maintenance) or
die(mysql_error());
}

$maxRows_Voyage = 10;
$pageNum_Voyage = 0;
if (isset($_GET['pageNum_Voyage'])) {
 $pageNum_Voyage = $_GET['pageNum_Voyage'];
}
$startRow_Voyage = $pageNum_Voyage * $maxRows_Voyage;

mysql_select_db($database_maintenance, $maintenance);
$query_Voyage = "SELECT * FROM voyage";
$query_limit_Voyage = sprintf("%s LIMIT %d, %d",
$query_Voyage, $startRow_Voyage, $maxRows_Voyage);
$Voyage = mysql_query($query_limit_Voyage, $maintenance) or
die(mysql_error());
$row_Voyage = mysql_fetch_assoc($Voyage);

if (isset($_GET['totalRows_Voyage'])) {
```

```
 $totalRows_Voyage = $_GET['totalRows_Voyage'];
} else {
 $all_Voyage = mysql_query($query_Voyage);
 $totalRows_Voyage = mysql_num_rows($all_Voyage);
}
$totalPages_Voyage = ceil($totalRows_Voyage/$maxRows_Voyage)-1;
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style2 {color: #FF0000}
-->
</style>
</head>

<body>
<div id="Title">
 <h1>Maintenance Management
 </h1>
 <h2>SHIPS </h2>
 <hr />

 <a href="Mainmenu.php">Home</a> | <a href="Input.php">Input Data</a> | <a href="Planning.php">Preventive Maintenance </a> | <a href="Voyage.php">Voyage Plan</a> | <a href="Work_order.php">Work Order</a> | <a
```

```
href="Data.php">View Data </a></div>
<table width="1093" height="271" border="0">
  <tr>
    <td width="288">Voyage Plan</td>
    <td width="44" height="267"> </td>
    <td width="391"><p>Voyage Input</p>
      <form method="post" name="form1" action="<?php echo
$editFormAction; ?>">
        <table align="left">
          <tr valign="baseline">
            <td nowrap align="right">Origin:</td>
            <td><input type="text" name="Origin" value=""
size="20"></td>
          </tr>
          <tr valign="baseline">
            <td nowrap align="right">ETD:</td>
            <td><input type="text" name="ETD" value=""
size="20"></td>
          </tr>
          <tr valign="baseline">
            <td nowrap align="right">Destination:</td>
            <td><input type="text" name="Destination" value=""
size="20"></td>
          </tr>
          <tr valign="baseline">
            <td nowrap align="right">ETA:</td>
            <td><input type="text" name="ETA" size="20"></td>
          </tr>
          <tr valign="baseline">
            <td nowrap align="right"> </td>
            <td><input type="submit" value="Submit"></td>
          </tr>
        </table>
        <input type="hidden" name="MM_insert" value="form1">
      </form>
```

```
    </td>
   <td width="352"><p> </p>
    <p>Voyage Plan</p>
    <table border="1">
      <tr>
        <td>Origin</td>
        <td>ETD</td>
        <td>Destination</td>
        <td>ETA</td>
      </tr>
      <?php do { ?>
        <tr>
          <td><?php echo $row_Voyage['Origin']; ?></td>
          <td><?php echo $row_Voyage['ETD']; ?></td>
          <td><?php echo $row_Voyage['Destination']; ?></td>
          <td><?php echo $row_Voyage['ETA']; ?></td>
        </tr>
        <?php } while ($row_Voyage = mysql_fetch_assoc($Voyage)); ?>
    </table>
    <p> </p>
   <p> </p></td>
  </tr>
</table>
<p align="right"> </p>
</body>

</html>
<?php
mysql_free_result($Voyage);
?>
```

Enclosure 5.6 Preventive Maintenance Menu



```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a href="Input.php">Input Data</a> | <a href="Planning.php">Preventive Maintenance </a> |<a href="Voyage.php"> Voyage Plan</a> | <a href="Work_order.php">Work Order</a> | <a href="Data.php">View Data </a></p>
</div>
```

```
<table width="1029" height="271" border="0">
  <tr>
    <td width="287">Preventive Maintenance </td>
    <td width="48" height="267"> </td>
    <td width="680"><div id="globalNav">
      <p><a href="Schedule.php">Maintenance Activity</a></p>
      <p><a href="Riskinput.php">Risk</a></p>
      <p><a href="Reminder.php">Reminder System </a></p>
      <p><a            href="Maintenance_record.php">Maintenance
Record</a> </p>
    </div></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
```

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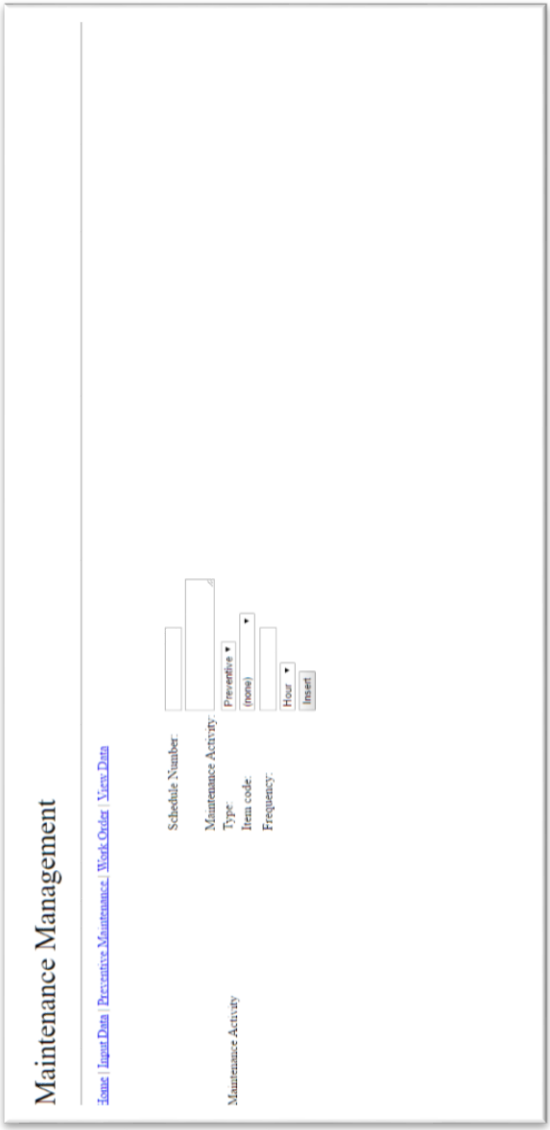
Enclosure 5.7 Maintenance Activity



```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a href="Input.php">Input Data</a> | <a href="Planning.php">Preventive Maintenance </a> | <a href="Work_order.php">Work Order</a> | <a href="Data.php">View Data </a></p>
</div>
```

```
<table width="1029" height="271" border="0">
  <tr>
    <td width="287">Preventive Maintenance </td>
    <td width="48" height="267"> </td>
    <td width="680"><div id="globalNav">
      <p><a href="Schedule.php">Maintenance Activity </a></p>
      <p><a                href="Planning_Simulation.php">Planning
Simulation</a></p>
      <p><a            href="Maintenance_record.php">Maintenance
Record</a> </p>
    </div></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
```

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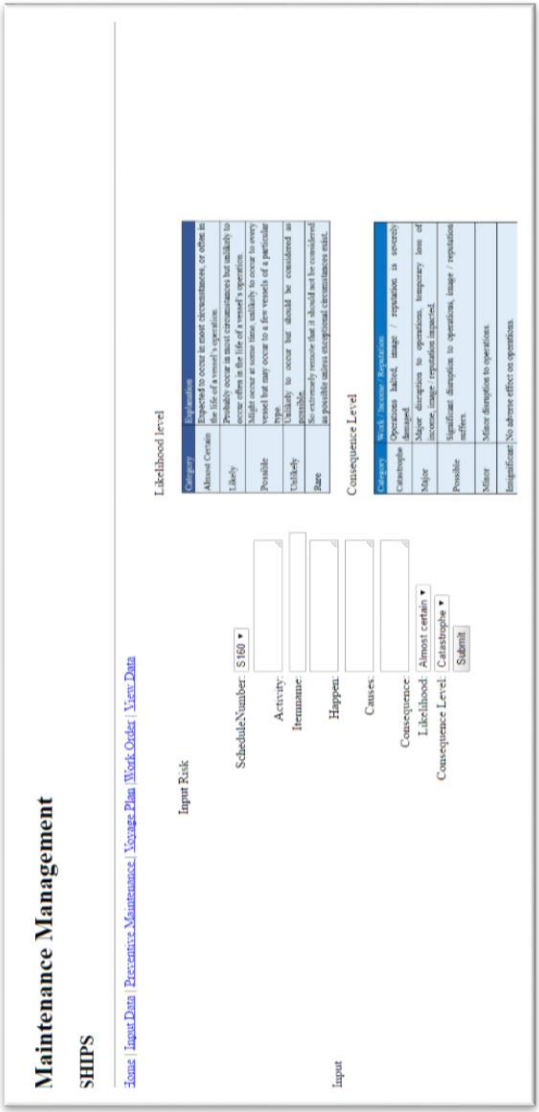
Enclosure 5.8 Risk Input



```
<?php require_once('Connections/maintenance.php'); ?>
<?php
function GetSQLValueString($theValue, $theType, $theDefinedValue = "", $theNotDefinedValue = "")
{
 $theValue = (!get_magic_quotes_gpc()) ? addslashes($theValue) : $theValue;

  switch ($theType) {
    case "text":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
      break;
    case "long":
    case "int":
      $theValue = ($theValue != "") ? intval($theValue) : "NULL";
      break;
    case "double":
      $theValue = ($theValue != "") ? "'" . doubleval($theValue) . "'" : "NULL";
      break;
    case "date":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
      break;
    case "defined":
      $theValue = ($theValue != "") ? $theDefinedValue : $theNotDefinedValue;
      break;
  }
  return $theValue;
}

$editFormAction = $_SERVER['PHP_SELF'];
if (isset($_SERVER['QUERY_STRING'])) {
```

```
 $editFormAction .= "?" . htmlentities($_SERVER['QUERY_STRING']);
}

if ((isset($_POST["MM_insert"])) && ($_POST["MM_insert"] == "form1")) {
 $insertSQL = sprintf("INSERT INTO risk (ScheduleNumber, Activity, Itemname, Happen, Causes, Consequence, Likelihood, `Level`) VALUES (%s, %s, %s, %s, %s, %s, %s, %s)",
                GetSQLValueString($_POST['ScheduleNumber'], "text"),
                GetSQLValueString($_POST['Activity'], "text"),
                GetSQLValueString($_POST['Itemname'], "text"),
                GetSQLValueString($_POST['Happen'], "text"),
                GetSQLValueString($_POST['Causes'], "text"),
                GetSQLValueString($_POST['Consequence'], "text"),
                GetSQLValueString($_POST['Likelihood'], "text"),
                GetSQLValueString($_POST['Level'], "text"));

 mysql_select_db($database_maintenance, $maintenance);
 $Result1 = mysql_query($insertSQL, $maintenance) or die(mysql_error());
}

mysql_select_db($database_maintenance, $maintenance);
$query_schedule = "SELECT SchNumber FROM schedule";
$schedule = mysql_query($query_schedule, $maintenance) or die(mysql_error());
$row_schedule = mysql_fetch_assoc($schedule);
$totalRows_schedule = mysql_num_rows($schedule);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
```

```
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style2 {color: #FF0000}
-->
</style>
</head>

<body>
<div id="Title">
  <h1>Maintenance Management
  </h1>
  <h2>SHIPS </h2>
  <hr />

  <a href="Mainmenu.php">Home</a> | <a href="Input.php">Input Data</a> | <a href="Planning.php">Preventive Maintenance </a> | <a href="Voyage.php">Voyage Plan</a> |<a href="Work_order.php">Work Order</a> | <a href="Data.php">View Data </a></div>
<table width="1093" height="271" border="0">
  <tr>
    <td width="288">Input</td>
    <td width="44" height="267"> </td>
    <td width="391"><p>Input Risk</p>
      <p> </p>
      <form method="post" name="form1" action="<?php echo $editFormAction; ?>">
        <table align="center">
          <tr valign="baseline">
```

```
          <td nowrap align="right">ScheduleNumber:</td>
          <td><select name="ScheduleNumber">
             <?php
do {
?>
             <option value="<?php echo
$row_schedule['SchNumber']?>" ><?php echo
$row_schedule['SchNumber']?></option>
             <?php
} while ($row_schedule = mysql_fetch_assoc($schedule));
?>
           </select>
          </td>
        <tr>
        <tr valign="baseline">
          <td nowrap align="right">Activity:</td>
          <td><textarea name="Activity"
cols="20"></textarea></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right">Itemname:</td>
          <td><input type="text" name="Itemname" value=""
size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right">Happen:</td>
          <td><textarea name="Happen"
cols="20"></textarea></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right">Causes:</td>
          <td><textarea name="Causes"
cols="20"></textarea></td>
        </tr>
        <tr valign="baseline">
```

```
        <td nowrap align="right">Consequence:</td>
        <td><textarea name="Consequence"
cols="20"></textarea></td>
      </tr>
      <tr valign="baseline">
        <td nowrap align="right">Likelihood:</td>
        <td><select name="Likelihood">
          <option value="Almost certain" <?php if
(!(strcmp("Almost certain", ""))) {echo "SELECTED";}
?>>Almost certain</option>
          <option value="Likely" <?php if (!(strcmp("Likely",
""))) {echo "SELECTED";} ?>>Likely</option>
          <option value="Possible" <?php if
(!(strcmp("Possible", ""))) {echo "SELECTED";}
?>>Possible</option>
          <option value="Unlikely" <?php if
(!(strcmp("Unlikely", ""))) {echo "SELECTED";}
?>>Unlikely</option>
          <option value="Rare" <?php if (!(strcmp("Rare", ""))
{echo "SELECTED";} ?>>Rare</option>
        </select>
        </td>
      </tr>
      <tr valign="baseline">
        <td nowrap align="right">Consequence Level:</td>
        <td><select name="Level">
          <option value="Catastrophe" <?php if
(!(strcmp("Catastrophe", ""))) {echo "SELECTED";}
?>>Catastrophe</option>
          <option value="Major" <?php if (!(strcmp("Major",
""))) {echo "SELECTED";} ?>>Major</option>
          <option value="Moderate" <?php if
(!(strcmp("Moderate", ""))) {echo "SELECTED";}
?>>Moderate</option>
          <option value="Minor" <?php if (!(strcmp("Minor",
```

```
""))) {echo "SELECTED";} ?>>Minor</option>
            <option value="Insignificant" <?php if
(!(strcmp("Insignificant", ""))) {echo "SELECTED";}
?>>Insignificant</option>
          </select>
        </td>
      </tr>
      <tr valign="baseline">
        <td nowrap align="right"> </td>
        <td><input type="submit" value="Submit"></td>
      </tr>
    </table>
    <input type="hidden" name="MM_insert" value="form1">
  </form>
  <p> </p></td>
  <td width="352"><p>Likelihood level</p>
    <p><img src="Likelihood.JPG" width="343" height="189"
/></p>
    <p>Consequence Level</p>
    <p><img src="Consequence.JPG" width="341" height="188"
/></p>
  </td>
 </tr>
</table>
<p align="right"> </p>
</body>

</html>
<?php
mysql_free_result($schedule);
?>
```

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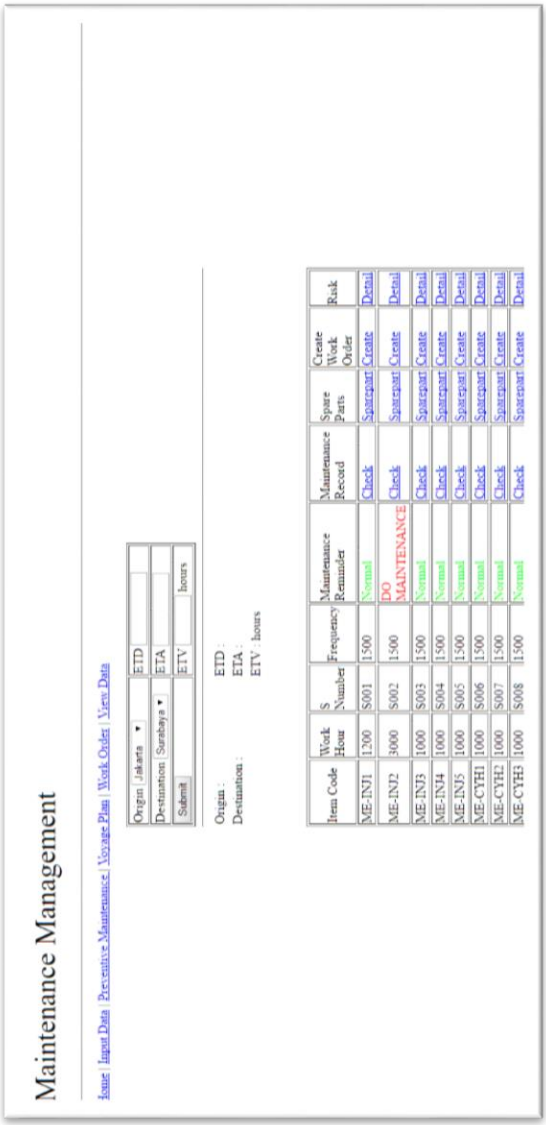
Enclosure 5.9 Reminder System



```
<?php require_once('Connections/maintenance.php'); ?>
<?php
mysql_select_db($database_maintenance, $maintenance);
$query_Reminder_System = "SELECT Item_code, Work_Hour, scheduleno, frequency FROM `input`";
$Reminder_System = mysql_query($query_Reminder_System, $maintenance) or die(mysql_error());
$row_Reminder_System = mysql_fetch_assoc($Reminder_System);
$totalRows_Reminder_System = mysql_num_rows($Reminder_System);

mysql_select_db($database_maintenance, $maintenance);
$query_Voyage = "SELECT Origin, ETD, Destination, ETA FROM voyage";
$Voyage = mysql_query($query_Voyage, $maintenance) or die(mysql_error());
$row_Voyage = mysql_fetch_assoc($Voyage);
$totalRows_Voyage = mysql_num_rows($Voyage);
?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>
```

```
        <?php
                ini_set('display_errors','off');
                error_reporting(0);?>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a>| <a
href="Voyage.php">Voyage Plan</a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Reminder System </td>
    <td width="46" height="267"> </td>
    <td width="683"><form id="form1" name="form1"
method="post" action="">
      <table width="347" border="1">
        <tr>
          <td width="176">Origin
            <select name="From">
              <?php
```

```
do {
?>
            <option                value="<?php                echo
$row_Voyage['Origin']?>"><?php                                  echo
$row_Voyage['Origin']?></option>
            <?php
} while ($row_Voyage = mysql_fetch_assoc($Voyage));
  $rows = mysql_num_rows($Voyage);
  if($rows > 0) {
     mysql_data_seek($Voyage, 0);
            $row_Voyage = mysql_fetch_assoc($Voyage);
  }
?>
           </select></td>
          <td width="155">ETD
           <input name="ETD" type="text" size="8" /></td>
        </tr>
        <tr>
          <td>Destination
            <select name="To">
             <?php
do {
?>
            <option                value="<?php                echo
$row_Voyage['Destination']?>"><?php                             echo
$row_Voyage['Destination']?></option>
            <?php
} while ($row_Voyage = mysql_fetch_assoc($Voyage));
  $rows = mysql_num_rows($Voyage);
  if($rows > 0) {
     mysql_data_seek($Voyage, 0);
            $row_Voyage = mysql_fetch_assoc($Voyage);
  }
?>
           </select></td>
```

```
        <td>ETA
          <input name="ETA" type="text" size="8" /></td>
       </tr>
       <tr>
        <td><input name="Submit" type="submit"
value="Submit" /></td>
        <td>ETV
          <input name="ETV" type="text" size="4" />
          hours</td>
       </tr>
      </table>
      <hr />
      <table width="347" border="0">
       <tr>
        <td width="177">Origin :
          <?php $from = $_POST['From']; echo "$from"; ?>
</td>
        <td width="160">ETD :
          <?php $etd = $_POST['ETD']; echo "$etd"; ?></td>
       </tr>
       <tr>
        <td>Destination :
          <?php $to = $_POST['To']; echo "$to"; ?></td>
        <td>ETA :
          <?php $eta = $_POST['ETA']; echo "$eta"; ?></td>
       </tr>
       <tr>
        <td> </td>
        <td>ETV :
          <?php $etv = $_POST['ETV']; echo "$etv"; ?>
          hours</td>
       </tr>
      </table>
      <p> </p>
      <table border="1">
```

```
<tr>
  <td>Item Code </td>
  <td>Work Hour</td>
  <td>S Number </td>
  <td>Frequency</td>
  <td>Maintenance Reminder</td>
  <td>Maintenance Record </td>
  <td>Spare Parts </td>
  <td>Create Work Order </td>
  <td>Risk</td>
</tr>
<?php do { ?>
<tr>
  <td><?php echo $row_Reminder_System['Item_code']; ?></td>
  <td><?php echo $row_Reminder_System['Work_Hour']; ?></td>
  <td><?php echo $row_Reminder_System['scheduleno']; ?></td>
  <td><?php echo $row_Reminder_System['frequency']; ?></td>
  <td><?php
                $etv = $_POST['ETV'];
                $wh = $row_Reminder_System['Work_Hour'];
                $frequency = $row_Reminder_System['frequency'];

                if( $frequency >($wh+$etv))
                 { echo "<div style ='color:#00ff00'> Normal </div>"; }
                else
                 { echo "<div style ='color:#ff0000'> DO MAINTENANCE </div>"; }
                ?></td>
```

```
        <td><a href="WO_viewalll.php?Schnumber=<?php echo
$row_Reminder_System['scheduleno']; ?>">Check</a></td>
        <td><a href="Sparepart_Data.php">Sparepart</a></td>
        <td><a href="Work_order.php?itemcode=<?php echo
$row_Reminder_System['Item_code']; ?>">Create</a></td>
        <td><a href="Risk.php?ScheduleNumber=<?php echo
$row_Reminder_System['scheduleno']; ?>">Detail</a></td>
      </tr>
      <?php } while ($row_Reminder_System =
mysql_fetch_assoc($Reminder_System)); ?>
    </table>
  </form></td>
 </tr>
</table>
<p align="justify"> </p>
</body>
</html>
<?php
mysql_free_result($Voyage);
?>
```

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Enclosure 5.10 Risk

Maintenance Management

Home | Input Data | Preventive Maintenance | Voyage Plan | Work Order | View Data

ScheduleNumber	Activity	Itemname	Happen	Causes	Consequence	Likelihood	Level	RISK Level
S001	1. Take out. check. fitting	Fuel injection	Wrong fuel spray pattern	Clogged fuel spray	Engine turn but fail to start	Likely	Major	Extreme
S001	1. Take out. check. fitting	Fuel injection	Injector defective	Poor Fuel Supply	Power loss	Almost certain	Moderate	Extreme
S001	1. Take out. check. fitting	Fuel injection	Injector defective	Knocking	Engine noise	Almost certain	Minor	High
S001	1. Take out. check. fitting	Fuel injection	Leaking injector	Hissing air	Engine noise	Likely	Minor	High

RISK

Ref: BSO 31000		Consequence				
Likelihood	Insignificant	Minor	Moderate	Major	Catastrophe	
Almost Certain	Moderate	High	Extreme	Extreme	Extreme	
Likely	Moderate	High	High	Extreme	Extreme	
Possible	Low	Moderate	High	Extreme	Extreme	
Unlikely	Low	Low	Moderate	High	Extreme	
Rare	Low	Low	Moderate	Moderate	High	

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
$colname_Risk = "-1";
if (isset($_GET['ScheduleNumber'])) {
  $colname_Risk = (get_magic_quotes_gpc()) ? $_GET['ScheduleNumber'] : addslashes($_GET['ScheduleNumber']);
}
mysql_select_db($database_maintenance, $maintenance);
$query_Risk = sprintf("SELECT * FROM risk WHERE ScheduleNumber = '%s'", $colname_Risk);
$Risk = mysql_query($query_Risk, $maintenance) or die(mysql_error());
$row_Risk = mysql_fetch_assoc($Risk);
$totalRows_Risk = mysql_num_rows($Risk);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
```

```
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> |<a
href="Voyage.php"> Voyage Plan</a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">RISK</td>
    <td width="46" height="267"> </td>
    <td width="683"><form id="form1" name="form1"
method="post" action="">
  <table border="1">
    <tr>
      <td>ScheduleNumber</td>
      <td>Activity</td>
      <td>Itemname</td>
      <td>Happen</td>
      <td>Causes</td>
      <td>Consequence</td>
      <td>Likelihood</td>
      <td>Level</td>
      <td>RISK Level </td>
    </tr>
    <?php do { ?>
      <tr>
        <td><?php echo $row_Risk['ScheduleNumber']; ?></td>
```

```
<td><?php echo $row_Risk['Activity']; ?></td>
<td><?php echo $row_Risk['Itemname']; ?></td>
<td><?php echo $row_Risk['Happen']; ?></td>
<td><?php echo $row_Risk['Causes']; ?></td>
<td><?php echo $row_Risk['Consequence']; ?></td>
<td><?php echo $row_Risk['Likelihood']; ?></td>
<td><?php echo $row_Risk['Level']; ?></td>
<td>
        <?php
                $lh     = $row_Risk['Likelihood'];
                $cl     = $row_Risk['Level'];

                if ($lh == 'Almost certain' && $cl ==
'Catastrophe')
                { echo "<div style ='color:#ff0000'>
Extreme </div>"; }
                else if
                ($lh == 'Almost certain' && $cl ==
'Major')
                { echo "<div style ='color:#ff0000'>
Extreme </div>"; }
                else if
                ($lh == 'Almost certain' && $cl ==
'Moderate')
                { echo "<div style ='color:#ff0000'>
Extreme </div>"; }
                else if
                ($lh == 'Almost certain' && $cl ==
'Minor')
                { echo "<div style ='color:#FFA500'>
High </div>"; }
                else if
                ($lh == 'Almost certain' && $cl ==
'Insignificant')
                { echo "<div style ='color:#FFFF00'>
```

```
Moderate </div>"; }
                    else if
                    ($lh == 'Likely' && $cl ==
'Catastrophe')
                    { echo "<div style ='color:#ff0000'>
Extreme </div>"; }
                    else if
                    ($lh == 'Likely' && $cl == 'Major')
                    { echo "<div style ='color:#ff0000'>
Extreme </div>"; }
                    else if
                    ($lh == 'Likely' && $cl == 'Moderate')
                    { echo "<div style ='color:#FFA500'>
High </div>"; }
                    else if
                    ($lh == 'Likely' && $cl == 'Minor')
                    { echo "<div style ='color:#FFA500'>
High </div>"; }
                    else if
                    ($lh == 'Likely' && $cl ==
'Insignificant')
                    { echo "<div style ='color:#FFFF00'>
Moderate </div>"; }
                    else if
                    ($lh == 'Possible' && $cl ==
'Catastrophe')
                    { echo "<div style ='color:#ff0000'>
Extreme </div>"; }
                    else if
                    ($lh == 'Possible' && $cl == 'Major')
                    { echo "<div style ='color:#ff0000'>
Extreme </div>"; }
                    else if
                    ($lh == 'Possible' && $cl ==
'Moderate')
```

```
                    { echo "<div style ='color:#FFA500'>
High </div>"; }
                    else if
                    ($lh == 'Possible' && $cl == 'Minor')
                    { echo "<div style ='color:#FFFF00'>
Moderate </div>"; }
                    else if
                    ($lh == 'Possible' && $cl ==
'Insignificant')
                    { echo "<div style ='color:#9ACD32'>
Low </div>"; }
                    else if
                    ($lh == 'Unlikely' && $cl ==
'Catastrophe')
                    { echo "<div style ='color:#ff0000'>
Extreme </div>"; }
                    else if
                    ($lh == 'Unlikely' && $cl == 'Major')
                    { echo "<div style ='color:#FFA500'>
High </div>"; }
                    else if
                    ($lh == 'Unlikely' && $cl ==
'Moderate')
                    { echo "<div style ='color:#FFFF00'>
Moderate </div>"; }
                    else if
                    ($lh == 'Unlikely' && $cl == 'Minor')
                    { echo "<div style ='color:#9ACD32'>
Low </div>"; }
                    else if
                    ($lh == 'Unlikely' && $cl ==
'Insignificant')
                    { echo "<div style ='color:#9ACD32'>
Low </div>"; }
                    else if
```

```
                        ($lh == 'Rare' && $cl == 'Catastrophe')
                        { echo "<div style ='color:#FFA500'>
High </div>"; }
                        else if
                        ($lh == 'Rare' && $cl == 'Major')
                        { echo "<div style ='color:#FFFF00'>
Moderate </div>"; }
                        else if
                        ($lh == 'Rare' && $cl == 'Moderate')
                        { echo "<div style ='color:#FFFF00'>
Moderate </div>"; }
                        else if
                        ($lh == 'Rare' && $cl == 'Minor')
                        { echo "<div style ='color:#9ACD32'>
Low </div>"; }
                        else if
                        ($lh == 'Rare' && $cl == 'Insignificant')
                        { echo "<div style ='color:#9ACD32'>
Low </div>"; }
                       ?>                </td>
    </tr>
    <?php } while ($row_Risk = mysql_fetch_assoc($Risk)); ?>
  </table>
</form>
<p><img src="Risk Matrix.JPG" width="483" height="120"
/></p>
</td>
  </tr>
</table>
</body>
</html>
<?php
mysql_free_result($Risk);
?>
```

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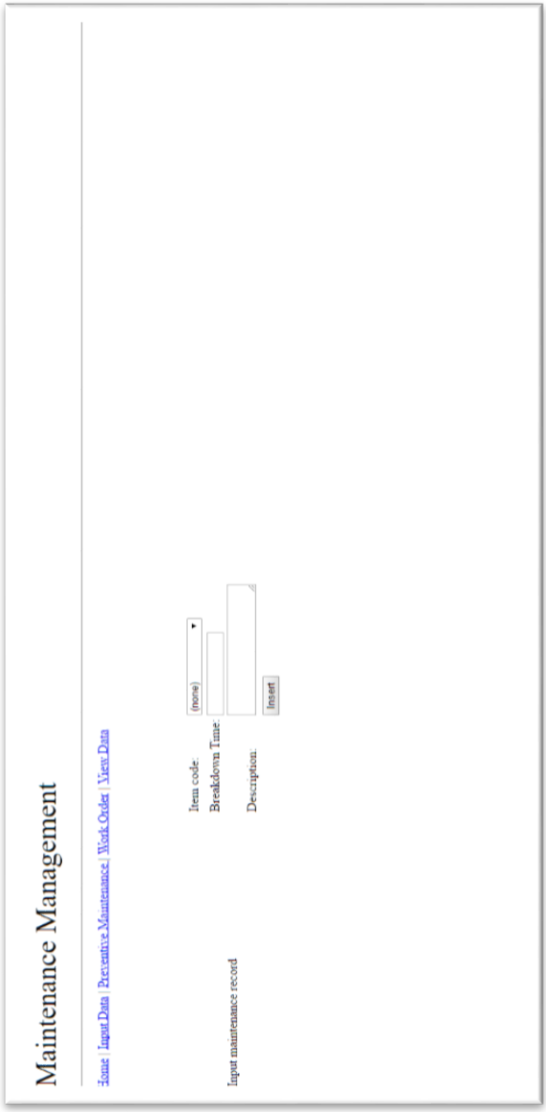
Enclosure 5.11 Input Maintenance Record



```
<?php require_once('Connections/maintenance.php'); ?>
<?php
function GetSQLValueString($theValue, $theType,
$theDefinedValue = "", $theNotDefinedValue = "")
{
 $theValue = (!get_magic_quotes_gpc()) ?
addslashes($theValue) : $theValue;

  switch ($theType) {
    case "text":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" :
"NULL";
      break;
    case "long":
    case "int":
      $theValue = ($theValue != "") ? intval($theValue) : "NULL";
      break;
    case "double":
      $theValue = ($theValue != "") ? "'" . doubleval($theValue) .
"'" : "NULL";
      break;
    case "date":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" :
"NULL";
      break;
    case "defined":
      $theValue = ($theValue != "") ? $theDefinedValue :
$theNotDefinedValue;
      break;
  }
  return $theValue;
}

$editFormAction = $_SERVER['PHP_SELF'];
if (isset($_SERVER['QUERY_STRING'])) {
```

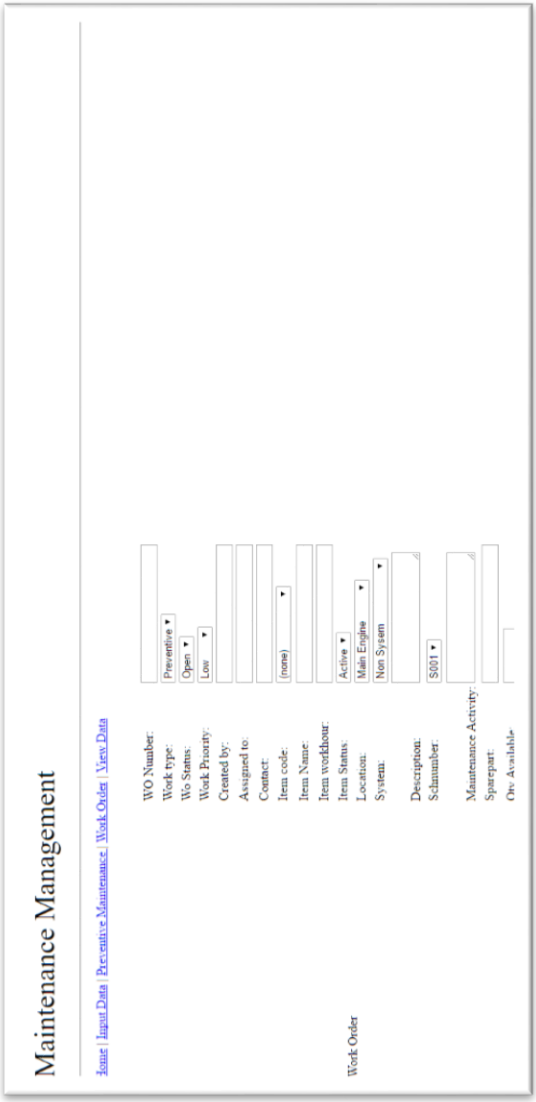
```
 $editFormAction .= "?" . htmlentities($_SERVER['QUERY_STRING']);
}

if ((isset($_POST["MM_insert"])) && ($_POST["MM_insert"] == "form1")) {
 $insertSQL = sprintf("INSERT INTO maintenance_record (Itemcode, BreakdownTime, Description) VALUES (%s, %s, %s)",
                GetSQLValueString($_POST['Itemcode'], "text"),
                GetSQLValueString($_POST['BreakdownTime'], "int"),
                GetSQLValueString($_POST['Description'], "text"));

 mysql_select_db($database_maintenance, $maintenance);
 $Result1 = mysql_query($insertSQL, $maintenance) or die(mysql_error());
}

mysql_select_db($database_maintenance, $maintenance);
$query_maintenancerecord = "SELECT Itemcode, BreakdownTime, Description FROM maintenance_record";
$maintenancerecord = mysql_query($query_maintenancerecord, $maintenance) or die(mysql_error());
$row_maintenancerecord = mysql_fetch_assoc($maintenancerecord);
$totalRows_maintenancerecord = mysql_num_rows($maintenancerecord);

mysql_select_db($database_maintenance, $maintenance);
$query_itemlist = "SELECT * FROM item";
$itemlist = mysql_query($query_itemlist, $maintenance) or die(mysql_error());
$row_itemlist = mysql_fetch_assoc($itemlist);
```

```
$totalRows_itemlist = mysql_num_rows($itemlist);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a href="Input.php">Input Data</a> | <a href="Planning.php">Preventive Maintenance </a> | <a href="Work_order.php">Work Order</a> | <a href="Data.php">View Data </a></p>
```

```
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="287">Input maintenance record </td>
    <td width="48" height="267"> </td>
    <td width="680"><form method="post" name="form1"
action="<?php echo $editFormAction; ?>">
      <table align="left">
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Item
code:</div></td>
          <td><select name="Itemcode">
            <?php
do {
?>
            <option value="<?php echo
$row_itemlist['itemcode']?>" ><?php echo
$row_itemlist['itemcode']?></option>
            <?php
} while ($row_itemlist = mysql_fetch_assoc($itemlist));
?>
          </select> </td>
        <tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Breakdown
Time:</div></td>
          <td><input type="text" name="BreakdownTime"
value="" size="10"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Description:</div></td>
          <td><textarea name="Description"
cols="20"></textarea></td>
        </tr>
```

```
          <tr valign="baseline">
            <td nowrap align="right"> </td>
            <td><input type="submit" value="Insert"></td>
          </tr>
        </table>
        <input type="hidden" name="MM_insert" value="form1">
      </form>
    <p> </p></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
<?php
mysql_free_result($maintenancerecord);

mysql_free_result($itemlist);
?>
```

Enclosure 5.12 Input Work Order



```
<?php require_once('Connections/maintenance.php'); ?>
<?php
function GetSQLValueString($theValue, $theType,
$theDefinedValue = "", $theNotDefinedValue = "")
{
 $theValue = (!get_magic_quotes_gpc()) ?
addslashes($theValue) : $theValue;

  switch ($theType) {
    case "text":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" :
"NULL";
      break;
    case "long":
    case "int":
      $theValue = ($theValue != "") ? intval($theValue) : "NULL";
      break;
    case "double":
      $theValue = ($theValue != "") ? "'" . doubleval($theValue) .
"'" : "NULL";
      break;
    case "date":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" :
"NULL";
      break;
    case "defined":
      $theValue = ($theValue != "") ? $theDefinedValue :
$theNotDefinedValue;
      break;
  }
  return $theValue;
}

$editFormAction = $_SERVER['PHP_SELF'];
if (isset($_SERVER['QUERY_STRING'])) {
```

```
 $editFormAction .= "?" .
htmlentities($_SERVER['QUERY_STRING']);
}

if ((isset($_POST["MM_insert"])) && ($_POST["MM_insert"]
== "form1")) {
 $insertSQL = sprintf("INSERT INTO workorder (WO_Number,
Work_type, Wo_Status, Work_Priority, Createdby, Assignedto,
Contact, itemcode, ItemName, itemworkhour, itemStatus,
Location, System, description, Schnumber, MaintenanceAct,
Sparepart, QtyAvailable, EmployeeName, EmployeeNumber)
VALUES (%s, %s, %s, %s, %s, %s, %s, %s, %s, %s, %s, %s,
%s, %s, %s, %s, %s, %s, %s, %s)",
                GetSQLValueString($_POST['WO_Number'],
"text"),
                GetSQLValueString($_POST['Work_type'],
"text"),
                GetSQLValueString($_POST['Wo_Status'], "text"),
                GetSQLValueString($_POST['Work_Priority'],
"text"),
                GetSQLValueString($_POST['Createdby'], "text"),
                GetSQLValueString($_POST['Assignedto'],
"text"),
                GetSQLValueString($_POST['Contact'], "text"),
                GetSQLValueString($_POST['itemcode'], "text"),
                GetSQLValueString($_POST['ItemName'], "text"),

GetSQLValueString($_POST['itemworkhour'], "text"),
                GetSQLValueString($_POST['itemStatus'], "text"),
                GetSQLValueString($_POST['Location'], "text"),
                GetSQLValueString($_POST['System'], "text"),
                GetSQLValueString($_POST['description'],
"text"),
                GetSQLValueString($_POST['Schnumber'],
"text"),
```

```
                GetSQLValueString($_POST['MaintenanceAct'],
"text"),
                GetSQLValueString($_POST['Sparepart'], "text"),
                GetSQLValueString($_POST['QtyAvailable'],
"int"),
                GetSQLValueString($_POST['EmployeeName'],
"text"),
                GetSQLValueString($_POST['EmployeeNumber'],
"int"));

  mysql_select_db($database_maintenance, $maintenance);
  $Result1 = mysql_query($insertSQL, $maintenance) or
die(mysql_error());
}

mysql_select_db($database_maintenance, $maintenance);
$query_itemlist = "SELECT * FROM item";
$itemlist = mysql_query($query_itemlist, $maintenance) or
die(mysql_error());
$row_itemlist = mysql_fetch_assoc($itemlist);
$totalRows_itemlist = mysql_num_rows($itemlist);

mysql_select_db($database_maintenance, $maintenance);
$query_maintenanceact = "SELECT SchNumber, PMactivity
FROM schedule";
$maintenanceact = mysql_query($query_maintenanceact,
$maintenance) or die(mysql_error());
$row_maintenanceact = mysql_fetch_assoc($maintenanceact);
$totalRows_maintenanceact =
mysql_num_rows($maintenanceact);

mysql_select_db($database_maintenance, $maintenance);
$query_sparepart = "SELECT Itemname, Itemcode, Sparepart,
Quantity FROM spareparts";
$sparepart = mysql_query($query_sparepart, $maintenance) or
```

```
die(mysql_error());
$row_sparepart = mysql_fetch_assoc($sparepart);
$totalRows_sparepart = mysql_num_rows($sparepart);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a href="Input.php">Input Data</a> | <a href="Planning.php">Preventive Maintenance </a> | <a
```

```
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="270" border="0">
  <tr>
    <td width="286">Work Order </td>
    <td width="48" height="266"> </td>
    <td width="681"> 
     <form method="post" name="form1" action="<?php echo
$editFormAction; ?>">
       <table align="left">
         <tr valign="baseline">
          <td nowrap align="right"><div align="left">WO
Number:</div></td>
          <td><input type="text" name="WO_Number" value=""
size="20"></td>
         </tr>
         <tr valign="baseline">
          <td nowrap align="right"><div align="left">Work
type:</div></td>
          <td><select name="Work_type">
            <option value="Preventiv" <?php if
(!(strcmp("Preventiv", ""))) {echo "SELECTED";}
?>>Preventive</option>
            <option value="Corrective" <?php if
(!(strcmp("Corrective", ""))) {echo "SELECTED";}
?>>Corrective</option>
           </select> </td>
         </tr>
         <tr valign="baseline">
          <td nowrap align="right"><div align="left">Wo
Status:</div></td>
          <td><select name="Wo_Status">
            <option value="Open" <?php if (!(strcmp("Open",
""))) {echo "SELECTED";} ?>>Open</option>
```

```
            <option value="Close" <?php if (!(strcmp("Close", ""))) {echo "SELECTED";} ?>>Close</option>
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Work Priority:</div></td>
          <td><select name="Work_Priority">
            <option value="Low" <?php if (!(strcmp("Low", ""))) {echo "SELECTED";} ?>>Low</option>
            <option value="Medium" <?php if (!(strcmp("Medium", ""))) {echo "SELECTED";} ?>>Medium</option>
            <option value="High" <?php if (!(strcmp("High", ""))) {echo "SELECTED";} ?>>High</option>
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Created by:</div></td>
          <td><input type="text" name="Createdby" value="" size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Assigned to:</div></td>
          <td><input type="text" name="Assignedto" value="" size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Contact:</div></td>
          <td><input type="text" name="Contact" value="" size="20"></td>
        </tr>
```

```
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Item
code:</div></td>
          <td><select name="itemcode">
            <?php
do {
?>
            <option value="<?php echo
$row_itemlist['itemcode']?>" ><?php echo
$row_itemlist['itemcode']?></option>
            <?php
} while ($row_itemlist = mysql_fetch_assoc($itemlist));
?>
          </select>          </td>
        <tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Item
Name:</div></td>
          <td><input type="text" name="ItemName" value=""
size="20"></td>
        </tr>
                    <tr valign="baseline">
          <td nowrap align="right"><div align="left">Item
workhour:</div></td>
          <td><input type="text" name="itemworkhour" value=""
size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Item
Status:</div></td>
          <td><select name="itemStatus">
            <option value="Active" <?php if (!(strcmp("Active",
""))) {echo "SELECTED";} ?>>Active</option>
            <option value="Failure" <?php if (!(strcmp("Failure",
""))) {echo "SELECTED";} ?>>Failure</option>
```

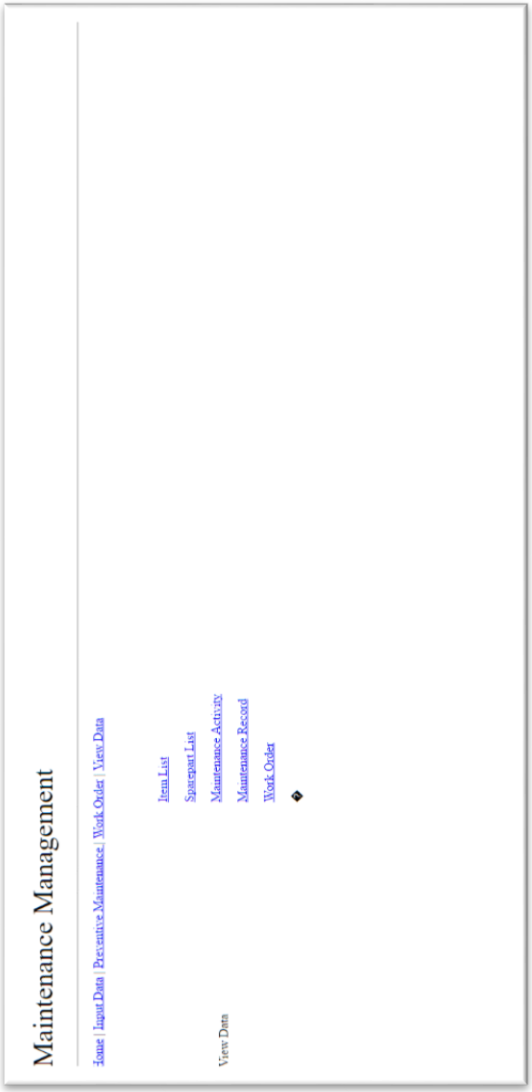
```
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Location:</div></td>
          <td><select name="Location">
            <option value="Main Engine" <?php if
(!(strcmp("Main Engine", ""))) {echo "SELECTED";} ?>>Main
Engine</option>
            <option value="Auxiliary Engine 1" <?php if
(!(strcmp("Auxiliary Engine 1", ""))) {echo "SELECTED";}
?>>Auxiliary Engine 1</option>
            <option value="Auxiliary Engine 2" <?php if
(!(strcmp("Auxiliary Engine 2", ""))) {echo "SELECTED";}
?>>Auxiliary Engine 2</option>
            <option value="Auxiliary Engine 3" <?php if
(!(strcmp("Auxiliary Engine 3", ""))) {echo "SELECTED";}
?>>Auxiliary Engine 3</option>
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">System:</div></td>
          <td><select name="System">
            <option value="Non System" <?php if (!(strcmp("Non
System", ""))) {echo "SELECTED";} ?>>Non Sysem</option>
            <option value="Fuel Oil System" <?php if
(!(strcmp("Fuel Oil System", ""))) {echo "SELECTED";}
?>>Fuel Oil System</option>
            <option value="Lub Oil System" <?php if
(!(strcmp("Lub Oil System", ""))) {echo "SELECTED";} ?>>Lub
Oil System</option>
            <option value="Cooling Water System" <?php if
(!(strcmp("Cooling Water System", ""))) {echo "SELECTED";}
?>>Cooling Water System</option>
```

```
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td          nowrap          align="right"><div
align="left">Description:</div></td>
          <td><textarea                    name="description"
cols="20"></textarea></td>
        </tr>
        <tr valign="baseline">
          <td          nowrap          align="right"><div
align="left">Schnumber:</div></td>
          <td><select name="Schnumber">
            <?php
do {
?>
            <option          value="<?php          echo
$row_maintenanceact['SchNumber']?>"  ><?php  echo
$row_maintenanceact['SchNumber']?></option>
            <?php
}          while          ($row_maintenanceact          =
mysql_fetch_assoc($maintenanceact));
?>
          </select>          </td>
        <tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Maintenance
Activity:</div></td>
          <td><textarea                name="MaintenanceAct"
cols="20"></textarea></td>
        </tr>
        <tr valign="baseline">
          <td          nowrap          align="right"><div
align="left">Sparepart:</div></td>
          <td><input  type="text"  name="Sparepart"  value=""
size="20" /></td>
```

```
        <tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Qty
Available:</div></td>
          <td><input type="text" name="QtyAvailable" value=""
size="5"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Employee
Name:</div></td>
          <td><input type="text" name="EmployeeName"
value="" size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left">Employee
Number:</div></td>
          <td><input type="text" name="EmployeeNumber"
value="" size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"> </td>
          <td><input type="submit" value="Insert"></td>
        </tr>
      </table>
      <input type="hidden" name="MM_insert" value="form1">
    </form>
   <p> </p></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
<?php
mysql_free_result($itemlist);
```

```
mysql_free_result($maintenanceact);

mysql_free_result($sparepart);
?>
```

Enclosure 5.13 View Data



<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0

```
Transitional//EN"  "http://www.w3.org/TR/xhtml1/DTD/xhtml1-
transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta  http-equiv="Content-Type"  content="text/html;
charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a  href="Mainmenu.php">Home</a>  |  <a
href="Input.php">Input  Data</a>  |  <a
href="Planning.php">Preventive  Maintenance  </a>  |  <a
href="Work_order.php">Work  Order</a>  |  <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
```

```
  <tr>
    <td width="286">View Data </td>
    <td width="46" height="267"> </td>
    <td width="683">
          <div id="viewnav">
            <p><a href="Item_Data.php">Item List</a></p>
            <p><a      href="Sparepart_Data.php">Sparepart      List
</a></p>
            <p><a            href="Schedule_Data.php">Maintenance
Activity</a></p>
            <p><a
href="Maintenance_record_Data.php">Maintenance   Record</a>
</p>
            <p><a href="WO_Data.php">Work Order</a></p>
          </div>
           </td>
  </tr>
</table>
</body>

</html>
```

“This Page Intentionally Left Blank”

Enclosure 5.14 Item List Data

Maintenance Management

Home | Input Data | Preventive Maintenance | Work Order | View Data

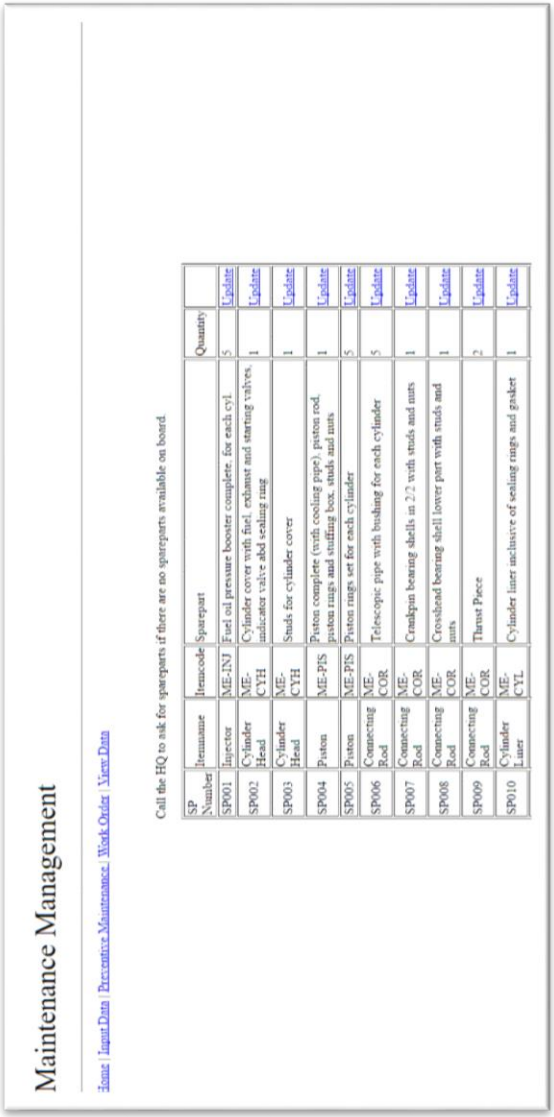
itemcode	itemname	Class	System
(none)	(none)	(none)	(none)
AE1-CAS	Camshaft	Auxiliary Engine 1	Non System
AE1-COR	Connecting Rod	Auxiliary Engine 1	Non System
AE1-COR1	Connecting Rod 1	Auxiliary Engine 1	Non System
AE1-COR2	Connecting Rod 2	Auxiliary Engine 1	Non System
AE1-COR3	Connecting Rod 3	Auxiliary Engine 1	Non System
AE1-COR4	Connecting Rod 4	Auxiliary Engine 1	Non System
AE1-COR5	Connecting Rod 5	Auxiliary Engine 1	Non System
AE1-COR6	Connecting Rod 6	Auxiliary Engine 1	Non System
AE1-CRS	Crankshaft	Auxiliary Engine 1	Non System
AE1-CRS1	Crankshaft 1	Auxiliary Engine 1	Non System
AE1-CRS2	Crankshaft 2	Auxiliary Engine 1	Non System
AE1-CRS3	Crankshaft 3	Auxiliary Engine 1	Non System
AE1-CRS4	Crankshaft 4	Auxiliary Engine 1	Non System
AE1-CRS5	Crankshaft 5	Auxiliary Engine 1	Non System
AE1-CRS6	Crankshaft 6	Auxiliary Engine 1	Non System
AE1-CWS-CWP	Cooling Water Pump	Auxiliary Engine 1	Cooling Water System
AE1-CWS-INT	Intercooler	Auxiliary Engine 1	Cooling Water System
AE1-CWS-THV	Thermostatic Valve	Auxiliary Engine 1	Cooling Water System
AE1-CYH	Cylinder Head	Auxiliary Engine 1	Non System

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
mysql_select_db($database_maintenance, $maintenance);
$query_Item_list = "SELECT * FROM item";
$Item_list = mysql_query($query_Item_list, $maintenance) or die(mysql_error());
$row_Item_list = mysql_fetch_assoc($Item_list);
$totalRows_Item_list = mysql_num_rows($Item_list);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
```

```
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Item List </td>
    <td width="46" height="267"> </td>
    <td width="683"><table border="1">
      <tr>
        <td>itemcode</td>
        <td>itemname</td>
        <td>Class</td>
        <td>System</td>
      </tr>
      <?php do { ?>
        <tr>
          <td><?php echo $row_Item_list['itemcode']; ?></td>
          <td><?php echo $row_Item_list['itemname']; ?></td>
          <td><?php echo $row_Item_list['Class']; ?></td>
          <td><?php echo $row_Item_list['System']; ?></td>
        </tr>
        <?php } while ($row_Item_list =
mysql_fetch_assoc($Item_list)); ?>
    </table></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
```

```
<?php
mysql_free_result($Item_list);
?>
```

Enclosure 5.15 Spare Parts List Data



Maintenance Management

Home | Input Data | Preventive Maintenance | Work Order | View Data

Call the HQ to ask for spareparts if there are no spareparts available on board.

SP Number	Itemname	Itemcode	Sparepart	Quantity	
SP001	Injector	ME-INJ	Fuel oil pressure booster complete. for each cyl	5	Update
SP002	Cylinder Head	ME-CYH	Cylinder cover with fuel, exhaust and starting valves, indicator valve and sealing ring	1	Update
SP003	Cylinder Head	ME-CYH	Studs for cylinder cover	1	Update
SP004	Piston	ME-PIS	Piston complete (with cooling pipe), piston rod, piston rings and stuffing box, studs and nuts	1	Update
SP005	Piston	ME-PIS	Piston rings set for each cylinder	5	Update
SP006	Connecting Rod	ME-COR	Telescopic pipe with bushing for each cylinder	5	Update
SP007	Connecting Rod	ME-COR	Crankpin bearing shells in 2/2 with studs and nuts	1	Update
SP008	Connecting Rod	ME-COR	Crosshead bearing shell lower part with studs and nuts	1	Update
SP009	Connecting Rod	ME-COR	Thrust Piece	2	Update
SP010	Cylinder Liner	ME-CYL	Cylinder liner inclusive of sealing rings and gasket	1	Update

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
mysql_select_db($database_maintenance, $maintenance);
$query_sparepartlist = "SELECT * FROM spareparts";
$sparepartlist = mysql_query($query_sparepartlist, $maintenance) or die(mysql_error());
$row_sparepartlist = mysql_fetch_assoc($sparepartlist);
$totalRows_sparepartlist = mysql_num_rows($sparepartlist);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
```

```
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Sparepart List </td>
    <td width="46" height="267"> </td>
    <td width="683"> 
     <p>Call the HQ to ask for spareparts if there are no
spareparts available on board. </p>
      <table border="1">
       <tr>
         <td>SP Number</td>
         <td>Itemname</td>
         <td>Itemcode</td>
         <td>Sparepart</td>
         <td>Quantity</td>
         <td> </td>
       </tr>
       <?php do { ?>
         <tr>
           <td><?php echo $row_sparepartlist['SPNumber'];
?></td>
           <td><?php echo $row_sparepartlist['Itemname']; ?></td>
           <td><?php echo $row_sparepartlist['Itemcode']; ?></td>
           <td><?php echo $row_sparepartlist['Sparepart']; ?></td>
           <td><?php echo $row_sparepartlist['Quantity']; ?></td>
           <td><a
href="Sparepart_Data_update.php?SPNumber=<?php echo
$row_sparepartlist['SPNumber']; ?>">Update</a></td>
```

```
        </tr>
        <?php } while ($row_sparepartlist = mysql_fetch_assoc($sparepartlist)); ?>
    </table></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
<?php
mysql_free_result($sparepartlist);
?>
```

Enclosure 5.16 Maintenance Activity Data

Maintenance Management

Home | Input Data | Preventive Maintenance | Work Order | View Data

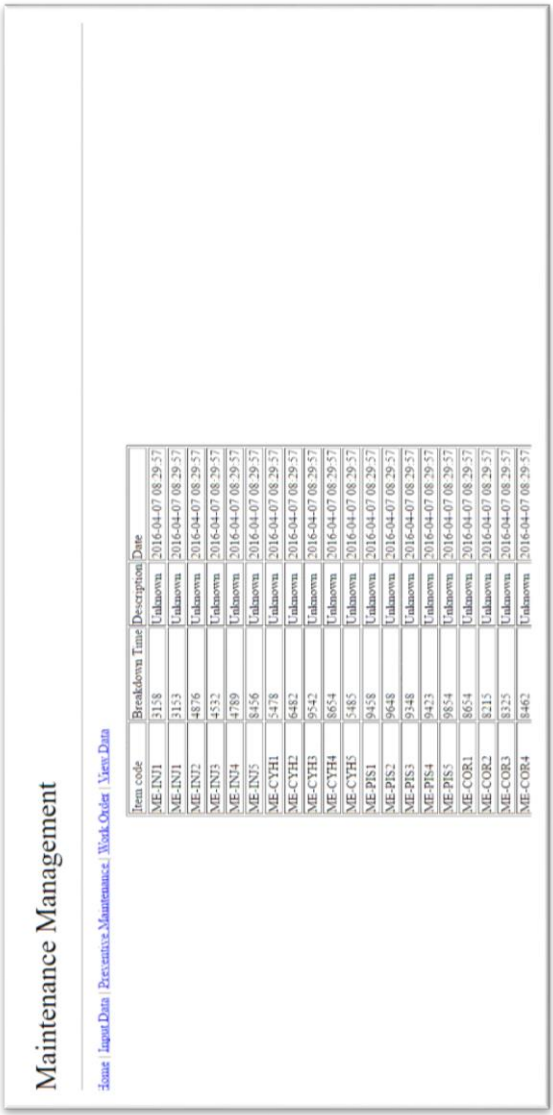
Schedule Number	Maintenance Activity	Maintenance Type	Item Code	Frequency	runetype
S001	1. Take out. check. fitting	Preventive	ME-IN1	1500	hour
S002	1. Take out. check. fitting	Preventive	ME-IN2	1500	hour
S003	1. Take out. check. fitting	Preventive	ME-IN3	1500	hour
S004	1. Take out. check. fitting	Preventive	ME-IN4	1500	hour
S005	1. Take out. check. fitting	Preventive	ME-IN5	1500	hour
S006	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH1	1500	hour
S007	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH2	1500	hour
S008	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH3	1500	hour
S009	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH4	1500	hour
S010	1. Check and fitting Valve Head Clearance	Preventive	ME-CYH5	1500	hour

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
mysql_select_db($database_maintenance, $maintenance);
$query_Schedule_List = "SELECT * FROM schedule";
$Schedule_List = mysql_query($query_Schedule_List, $maintenance) or die(mysql_error());
$row_Schedule_List = mysql_fetch_assoc($Schedule_List);
$totalRows_Schedule_List = mysql_num_rows($Schedule_List);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
```

```
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Schedule List </td>
    <td width="46" height="267"> </td>
    <td width="683"> 
      <table border="1">
        <tr>
          <td>Schedule Number</td>
          <td>Maintenance Activity</td>
          <td>Maintenance Type </td>
          <td>Item Code</td>
          <td>Frequency</td>
          <td>timetype</td>
        </tr>
        <?php do { ?>
          <tr>
            <td><?php echo $row_Schedule_List['SchNumber'];
?></td>
            <td><?php echo $row_Schedule_List['PMactivity'];
?></td>
            <td><?php echo $row_Schedule_List['type']; ?></td>
            <td><?php echo $row_Schedule_List['Itemcode'];
?></td>
            <td><?php echo $row_Schedule_List['Frequency'];
?></td>
            <td><?php echo $row_Schedule_List['timetype'];
?></td>
```

```
        </tr>
        <?php } while ($row_Schedule_List = mysql_fetch_assoc($Schedule_List)); ?>
      </table></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
<?php
mysql_free_result($Schedule_List);
?>
```

Enclosure 5.17 Maintenance Record Data



Maintenance Management

Home | Input Data | Preventive Maintenance | Work Order | View Data

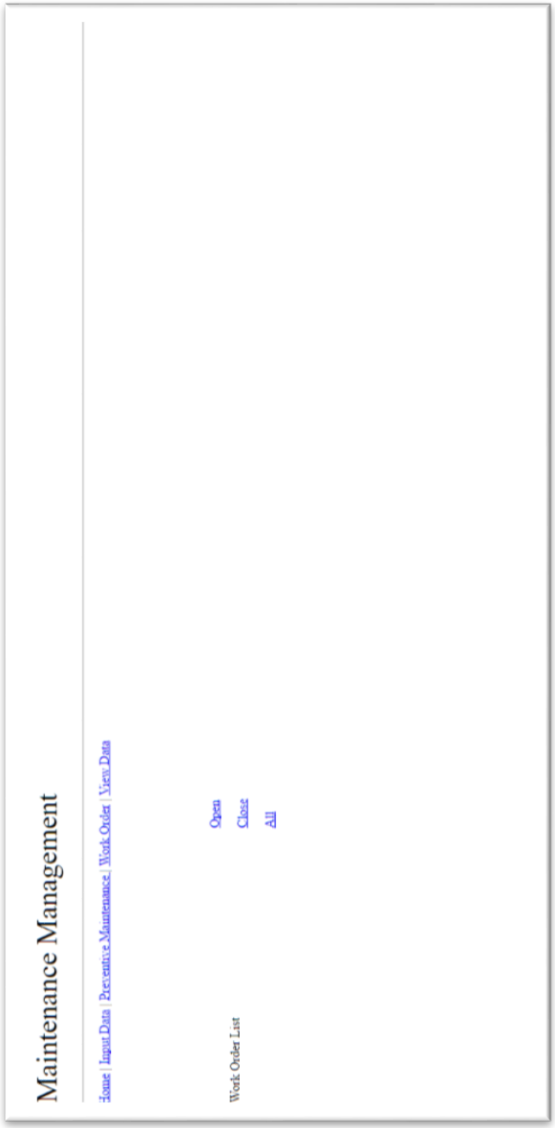
Item code	Breakdown Time	Description	Date
ME-IN1	3158	Unknown	2016-04-07 08:29:57
ME-IN1	3153	Unknown	2016-04-07 08:29:57
ME-IN2	4876	Unknown	2016-04-07 08:29:57
ME-IN3	4532	Unknown	2016-04-07 08:29:57
ME-IN4	4789	Unknown	2016-04-07 08:29:57
ME-IN5	8456	Unknown	2016-04-07 08:29:57
ME-CYH1	5478	Unknown	2016-04-07 08:29:57
ME-CYH2	6482	Unknown	2016-04-07 08:29:57
ME-CYH3	9542	Unknown	2016-04-07 08:29:57
ME-CYH4	8654	Unknown	2016-04-07 08:29:57
ME-CYH5	5485	Unknown	2016-04-07 08:29:57
ME-PIS1	9458	Unknown	2016-04-07 08:29:57
ME-PIS2	9648	Unknown	2016-04-07 08:29:57
ME-PIS3	9348	Unknown	2016-04-07 08:29:57
ME-PIS4	9423	Unknown	2016-04-07 08:29:57
ME-PIS5	9854	Unknown	2016-04-07 08:29:57
ME-COR1	8654	Unknown	2016-04-07 08:29:57
ME-COR2	8215	Unknown	2016-04-07 08:29:57
ME-COR3	8325	Unknown	2016-04-07 08:29:57
ME-COR4	8462	Unknown	2016-04-07 08:29:57

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
mysql_select_db($database_maintenance, $maintenance);
$query_maintenancerecord = "SELECT Itemcode, BreakdownTime, Description, `Date` FROM maintenance_record";
$maintenancerecord = mysql_query($query_maintenancerecord, $maintenance) or die(mysql_error());
$row_maintenancerecord = mysql_fetch_assoc($maintenancerecord);
$totalRows_maintenancerecord = mysql_num_rows($maintenancerecord);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
```

```
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Maintenance Record </td>
    <td width="46" height="267"> </td>
    <td width="683"><table border="1">
      <tr>
        <td>Item code</td>
        <td>Breakdown Time</td>
        <td>Description</td>
        <td>Date</td>
      </tr>
      <?php do { ?>
        <tr>
          <td><?php echo $row_maintenancerecord['Itemcode'];
?></td>
          <td><?php echo
$row_maintenancerecord['BreakdownTime']; ?></td>
          <td><?php echo $row_maintenancerecord['Description'];
?></td>
          <td><?php echo $row_maintenancerecord['Date'];
?></td>
        </tr>
        <?php } while ($row_maintenancerecord =
```

```
mysql_fetch_assoc($maintenancerecord)); ?>
    </table></td>
  </tr>
</table>
</body>

</html>
<?php
mysql_free_result($maintenancerecord);
?>
```

Enclosure 5.18 Work Order Menu



```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
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.style1 {font-size: 36px}
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-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a href="Input.php">Input Data</a> | <a href="Planning.php">Preventive Maintenance </a> | <a href="Work_order.php">Work Order</a> | <a href="Data.php">View Data </a></p>
</div>
```

```
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Work Order List </td>
    <td width="46" height="267"> </td>
    <td width="683"> 
    <p><a
href="WO_viewop.php?Wo_Status=Open">Open</a></p>
    <p><a
href="WO_viewcl.php?Wo_Status=Close">Close</a></p>
    <p><a href="WO_viewall.php">All</a></p></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
```

“This Page Intentionally Left Blank”

Enclosure 5.19 Open Work Order Data

Maintenance Management

Home | Input Data | Preventive Maintenance | Work Order | View Data

Work Order List

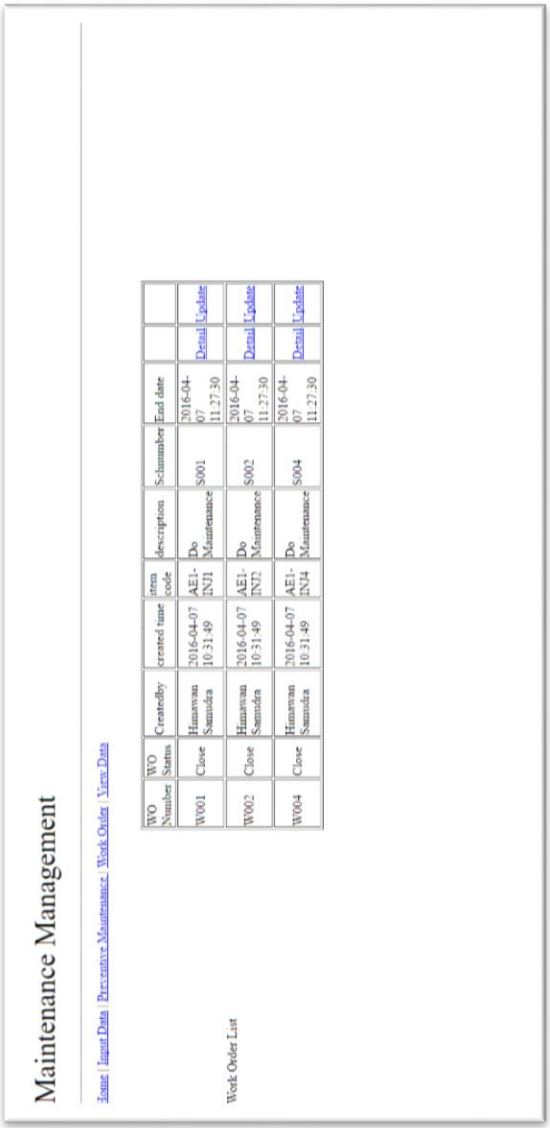
WO Number	WO Status	Createdby:	createdtime	itemcode	description	Schnumber		
W003	Open	Himawan Samuden	2016-04-07 10:31:49	AE1-IN3	Do Maintenance	S003	Detail	Update

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
$colname_workorderlilst = "-1";
if (isset($_GET['Wo_Status'])) {
  $colname_workorderlilst = (get_magic_quotes_gpc()) ? $_GET['Wo_Status'] : addslashes($_GET['Wo_Status']);
}
mysql_select_db($database_maintenance, $maintenance);
$query_workorderlilst = sprintf("SELECT * FROM workorder WHERE Wo_Status = '%s'", $colname_workorderlilst);
$workorderlilst = mysql_query($query_workorderlilst, $maintenance) or die(mysql_error());
$row_workorderlilst = mysql_fetch_assoc($workorderlilst);
$totalRows_workorderlilst = mysql_num_rows($workorderlilst);
?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
```

```
    <div align="left">Maintenance Management </div>
   </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Work Order List </td>
    <td width="46" height="267"> </td>
    <td width="683"><table border="1">
      <tr>
        <td>WO Number</td>
        <td>WO Status</td>
        <td>Createdby</td>
        <td>createdtime</td>
        <td>itemcode</td>
        <td>description</td>
        <td>Schnumber</td>
        <td> </td>
        <td> </td>
      </tr>
      <?php do { ?>
        <tr>
          <td><?php echo $row_workorderlilst['WO_Number'];
?></td>
```

```
        <td><?php  echo  $row_workorderlilst['Wo_Status'];
?></td>
        <td><?php  echo  $row_workorderlilst['Createdby'];
?></td>
        <td><?php  echo  $row_workorderlilst['createdtime'];
?></td>
        <td><?php  echo  $row_workorderlilst['itemcode'];
?></td>
        <td><?php  echo  $row_workorderlilst['description'];
?></td>
        <td><?php  echo  $row_workorderlilst['Schnumber'];
?></td>
        <td><a  href="Print.php?WO_Number=<?php  echo
$row_workorderlilst['WO_Number']; ?>">Detail</a></td>
        <td><a  href="WO_update.php?WO_Number=<?php
echo $row_workorderlilst['WO_Number']; ?>">Update</a></td>
      </tr>
      <?php  }  while  ($row_workorderlilst  =
mysql_fetch_assoc($workorderlilst)); ?>
    </table>
    <p> </p>
    </td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
<?php
mysql_free_result($workorderlilst);
?>
```

Enclosure 5.20 Close Work Order Data



Maintenance Management

Home | Input Data | Preventive Maintenance | Work Order | View Data

Work Order List

WO Number	WO Status	Createdby	created time	item code	description	Schnumber	End date		
W001	Close	Hunawan Samudra	2016-04-07 10:31:49	AE1-IN1	Do Maintenance	S001	2016-04-07 11:27:30	Detail	Update
W002	Close	Hunawan Samudra	2016-04-07 10:31:49	AE1-IN2	Do Maintenance	S002	2016-04-07 11:27:30	Detail	Update
W004	Close	Hunawan Samudra	2016-04-07 10:31:49	AE1-IN4	Do Maintenance	S004	2016-04-07 11:27:30	Detail	Update

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
$colname_workorderlilst = "-1";
if (isset($_GET['Wo_Status'])) {
  $colname_workorderlilst = (get_magic_quotes_gpc()) ? $_GET['Wo_Status'] : addslashes($_GET['Wo_Status']);
}
mysql_select_db($database_maintenance, $maintenance);
$query_workorderlilst = sprintf("SELECT * FROM workorder WHERE Wo_Status = '%s'", $colname_workorderlilst);
$workorderlilst = mysql_query($query_workorderlilst, $maintenance) or die(mysql_error());
$row_workorderlilst = mysql_fetch_assoc($workorderlilst);
$totalRows_workorderlilst = mysql_num_rows($workorderlilst);
?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
```

```
    <div align="left">Maintenance Management </div>
   </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Work Order List </td>
    <td width="46" height="267"> </td>
    <td width="683"><table border="1">
      <tr>
        <td>WO Number</td>
        <td>WO Status</td>
        <td>Createdby</td>
        <td>created time</td>
        <td>item code</td>
        <td>description</td>
        <td>Schnumber</td>
        <td>End date</td>
        <td> </td>
        <td> </td>
      </tr>
      <?php do { ?>
        <tr>
          <td><?php    echo    $row_workorderlilst['WO_Number'];
```

```
?></td>
        <td><?php  echo  $row_workorderlilst['Wo_Status'];
?></td>
        <td><?php  echo  $row_workorderlilst['Createdby'];
?></td>
        <td><?php  echo  $row_workorderlilst['createdtime'];
?></td>
        <td><?php  echo  $row_workorderlilst['itemcode'];
?></td>
        <td><?php  echo  $row_workorderlilst['description'];
?></td>
        <td><?php  echo  $row_workorderlilst['Schnumber'];
?></td>
        <td><?php echo $row_workorderlilst['enddate']; ?></td>
        <td><a  href="Print.php?WO_Number=<?php  echo
$row_workorderlilst['WO_Number']; ?>">Detail</a></td>
        <td><a  href="WO_update.php?WO_Number=<?php
echo $row_workorderlilst['WO_Number']; ?>">Update</a></td>
      </tr>
      <?php  }  while  ($row_workorderlilst  =
mysql_fetch_assoc($workorderlilst)); ?>
    </table>
    </td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
<?php
mysql_free_result($workorderlilst);
?>
```

Enclosure 5.21 Work Order Data All

Maintenance Management

Home | Input Data | Preventive Maintenance | Work Order | View Data

Work Order List

WO Number	Wo Status	Created by	item code	description	Sch number	Work Hour		
W001	Close	Himawan Saisuka	AE1-IN1	Do Maintenance	S001	1501	Detail	Update
W002	Close	Himawan Saisuka	AE1-IN2	Do Maintenance	S002	1502	Detail	Update
W003	Open	Himawan Saisuka	AE1-IN3	Do Maintenance	S003	1503	Detail	Update
W004	Close	Himawan Saisuka	AE1-IN4	Do Maintenance	S004	1504	Detail	Update

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
mysql_select_db($database_maintenance, $maintenance);
$query_workorderlilst = "SELECT * FROM workorder";
$workorderlilst = mysql_query($query_workorderlilst, $maintenance) or die(mysql_error());
$row_workorderlilst = mysql_fetch_assoc($workorderlilst);
$totalRows_workorderlilst = mysql_num_rows($workorderlilst);
?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
</table>
<p> </p>
<p> </p>
```

```
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Work Order List </td>
    <td width="46" height="267"> </td>
    <td width="683"><table border="1">
      <tr>
        <td>WO Number</td>
        <td>Wo Status</td>
        <td>Created by</td>
        <td>item code</td>
        <td>description</td>
        <td>Sch number</td>
        <td> </td>
        <td> </td>
      </tr>
      <?php do { ?>
        <tr>
          <td><?php echo $row_workorderlilst['WO_Number'];
?></td>
          <td><?php echo $row_workorderlilst['Wo_Status'];
?></td>
          <td><?php echo $row_workorderlilst['Createdby'];
?></td>
          <td><?php echo $row_workorderlilst['itemcode'];
?></td>
          <td><?php echo $row_workorderlilst['description'];
```

```
?></td>
        <td><?php echo $row_workorderlilst['Schnumber']; ?></td>
        <td><a href="Print.php?WO_Number=<?php echo $row_workorderlilst['WO_Number']; ?>">Detail</a></td>
        <td><a href="WO_update.php?WO_Number=<?php echo $row_workorderlilst['WO_Number']; ?>">Update</a></td>
      </tr>
      <?php } while ($row_workorderlilst = mysql_fetch_assoc($workorderlilst)); ?>
    </table></td>
  </tr>
</table>
<p align="justify"> </p>
</body>
</html>
<?php
mysql_free_result($workorderlilst);
?>
```

Enclosure 5.22 Update Work Order

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
function GetSQLValueString($theValue, $theType, $theDefinedValue = "", $theNotDefinedValue = "")
{
 $theValue = (!get_magic_quotes_gpc()) ? addslashes($theValue) : $theValue;

  switch ($theType) {
    case "text":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
      break;
    case "long":
    case "int":
      $theValue = ($theValue != "") ? intval($theValue) : "NULL";
      break;
    case "double":
      $theValue = ($theValue != "") ? "'" . doubleval($theValue) . "'" : "NULL";
      break;
    case "date":
      $theValue = ($theValue != "") ? "'" . $theValue . "'" : "NULL";
      break;
    case "defined":
      $theValue = ($theValue != "") ? $theDefinedValue : $theNotDefinedValue;
      break;
  }
  return $theValue;
}

$editFormAction = $_SERVER['PHP_SELF'];
if (isset($_SERVER['QUERY_STRING'])) {
```

```
 $editFormAction .= "?" .
htmlentities($_SERVER['QUERY_STRING']);
}

if ((isset($_POST["MM_update"])) && ($_POST["MM_update"]
== "form1")) {
 $updateSQL = sprintf("UPDATE workorder SET
Work_type=%s, Wo_Status=%s, Work_Priority=%s,
Createdby=%s, Assignedto=%s, createdtime=%s, Contact=%s,
itemcode=%s, ItemName=%s, itemworkhour=%s,
itemStatus=%s, Location=%s, System=%s, description=%s,
Schnumber=%s, MaintenanceAct=%s, Sparepart=%s,
QtyAvailable=%s, EmployeeName=%s, EmployeeNumber=%s
WHERE WO_Number=%s",
                GetSQLValueString($_POST['Work_type'],
"text"),
                GetSQLValueString($_POST['Wo_Status'], "text"),
                GetSQLValueString($_POST['Work_Priority'],
"text"),
                GetSQLValueString($_POST['Createdby'], "text"),
                GetSQLValueString($_POST['Assignedto'],
"text"),
                GetSQLValueString($_POST['createdtime'],
"date"),
                GetSQLValueString($_POST['Contact'], "text"),
                GetSQLValueString($_POST['itemcode'], "text"),
                GetSQLValueString($_POST['ItemName'], "text"),
                GetSQLValueString($_POST['itemworkhour'],
"int"),
                GetSQLValueString($_POST['itemStatus'], "text"),
                GetSQLValueString($_POST['Location'], "text"),
                GetSQLValueString($_POST['System'], "text"),
                GetSQLValueString($_POST['description'],
"text"),
                GetSQLValueString($_POST['Schnumber'],
```

```
"text"),
                GetSQLValueString($_POST['MaintenanceAct'],
"text"),
                GetSQLValueString($_POST['Sparepart'], "text"),
                GetSQLValueString($_POST['QtyAvailable'],
"int"),
                GetSQLValueString($_POST['EmployeeName'],
"text"),
                GetSQLValueString($_POST['EmployeeNumber'],
"int"),
                GetSQLValueString($_POST['WO_Number'],
"text"));

  mysql_select_db($database_maintenance, $maintenance);
  $Result1 = mysql_query($updateSQL, $maintenance) or
die(mysql_error());
}

mysql_select_db($database_maintenance, $maintenance);
$query_itemlist = "SELECT * FROM item";
$itemlist = mysql_query($query_itemlist, $maintenance) or
die(mysql_error());
$row_itemlist = mysql_fetch_assoc($itemlist);
$totalRows_itemlist = mysql_num_rows($itemlist);

mysql_select_db($database_maintenance, $maintenance);
$query_maintenanceactvity = "SELECT SchNumber, PMactivity
FROM schedule";
$maintenanceactvity = mysql_query($query_maintenanceactvity,
$maintenance) or die(mysql_error());
$row_maintenanceactvity                                    =
mysql_fetch_assoc($maintenanceactvity);
$totalRows_maintenanceactvity                              =
mysql_num_rows($maintenanceactvity);
```

```
$colname_workorderlist = "-1";
if (isset($_GET['WO_Number'])) {
  $colname_workorderlist = (get_magic_quotes_gpc()) ? $_GET['WO_Number'] : addslashes($_GET['WO_Number']);
}
mysql_select_db($database_maintenance, $maintenance);
$query_workorderlist = sprintf("SELECT * FROM workorder WHERE WO_Number = '%s'", $colname_workorderlist);
$workorderlist = mysql_query($query_workorderlist, $maintenance) or die(mysql_error());
$row_workorderlist = mysql_fetch_assoc($workorderlist);
$totalRows_workorderlist = mysql_num_rows($workorderlist);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
<style type="text/css">
<!--
.style1 {font-size: 36px}
.style4 {color: #660066}
-->
</style>
</head>

<body>
<table width="767" border="0" align="left">
  <tr>
    <td width="757"><div align="center" class="style1">
      <div align="left">Maintenance Management </div>
    </div></td>
  </tr>
```

```
</table>
<p> </p>
<p> </p>
<p>SHIPS_A</p>
<hr />
<div id="navigation">
  <p><a href="Mainmenu.php">Home</a> | <a
href="Input.php">Input Data</a> | <a
href="Planning.php">Preventive Maintenance </a> | <a
href="Work_order.php">Work Order</a> | <a
href="Data.php">View Data </a></p>
</div>
<table width="1029" height="271" border="0">
  <tr>
    <td width="286">Update Work Order</td>
    <td width="46" height="267"> </td>
    <td width="683"><form method="post" name="form1"
action="<?php echo $editFormAction; ?>">
      <table align="left">
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">WO_Number:</div></td>
          <td><?php echo $row_workorderlist['WO_Number'];
?></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Work_type:</div></td>
          <td><select name="Work_type">
              <option value="Preventive" <?php if
(!(strcmp("Preventive", $row_workorderlist['Work_type'])))
{echo "SELECTED";} ?>>Preventive</option>
              <option value="Corrective" <?php if
(!(strcmp("Corrective", $row_workorderlist['Work_type'])))
{echo "SELECTED";} ?>>Corrective</option>
```

```
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td                nowrap                align="right"><div
align="left">Wo_Status:</div></td>
          <td><select name="Wo_Status">
            <option value="Open" <?php if (!(strcmp("Open",
$row_workorderlist['Wo_Status']))) {echo "SELECTED";}
?>>Open</option>
            <option value="Close" <?php if (!(strcmp("Close",
$row_workorderlist['Wo_Status']))) {echo "SELECTED";}
?>>Close</option>
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td                nowrap                align="right"><div
align="left">Work_Priority:</div></td>
          <td><select name="Work_Priority">
            <option value="Low" <?php if (!(strcmp("Low",
$row_workorderlist['Work_Priority']))) {echo "SELECTED";}
?>>Low</option>
            <option          value="Medium"          <?php          if
(!(strcmp("Medium",          $row_workorderlist['Work_Priority'])))
{echo "SELECTED";} ?>>Medium</option>
            <option value="High" <?php if (!(strcmp("High",
$row_workorderlist['Work_Priority']))) {echo "SELECTED";}
?>>High</option>
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td                nowrap                align="right"><div
align="left">Createdby:</div></td>
          <td><input type="text" name="Createdby" value="<?php
echo $row_workorderlist['Createdby']; ?>" size="20"></td>
        </tr>
```

```
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Assignedto:</div></td>
          <td><input type="text" name="Assignedto"
value="<?php echo $row_workorderlist['Assignedto']; ?>"
size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Createdtime:</div></td>
          <td><input type="text" name="createdtime"
value="<?php echo $row_workorderlist['createdtime']; ?>"
size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Contact:</div></td>
          <td><input type="text" name="Contact" value="<?php
echo $row_workorderlist['Contact']; ?>" size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Itemcode:</div></td>
          <td><select name="itemcode">
            <?php
do {
?>
            <option value="<?php echo
$row_itemlist['itemcode']?>" <?php if
(!(strcmp($row_itemlist['itemcode'],
$row_workorderlist['itemcode']))) {echo "SELECTED";}
?>><?php echo $row_itemlist['itemcode']?></option>
            <?php
} while ($row_itemlist = mysql_fetch_assoc($itemlist));
?>
```

```
          </select>          </td>
        <tr>
        <tr valign="baseline">
          <td          nowrap          align="right"><div
align="left">ItemName:</div></td>
          <td><input type="text" name="ItemName" value="<?php
echo $row_workorderlist['ItemName']; ?>" size="20"></td>
        </tr>
        <tr valign="baseline">
          <td          nowrap          align="right"><div
align="left">Itemworkhour:</div></td>
          <td><input          type="text"          name="itemworkhour"
value="<?php echo $row_workorderlist['itemworkhour']; ?>"
size="20"></td>
        </tr>
        <tr valign="baseline">
          <td          nowrap          align="right"><div
align="left">ItemStatus:</div></td>
          <td><input type="text" name="itemStatus" value="<?php
echo $row_workorderlist['itemStatus']; ?>" size="20"></td>
        </tr>
        <tr valign="baseline">
          <td          nowrap          align="right"><div
align="left">Location:</div></td>
          <td><select name="Location">
            <option          value="Main          Engine"          <?php          if
(!(strcmp("Main          Engine",          $row_workorderlist['Location'])))
{echo "SELECTED";} ?>>Main Engine</option>
            <option          value="Auxiliary          Engine          1"          <?php          if
(!(strcmp("Auxiliary                Engine                1",
$row_workorderlist['Location']))) {echo "SELECTED";}
?>>Auxiliary Engine 1</option>
            <option          value="Auxiliary          Engine          2"          <?php          if
(!(strcmp("Auxiliary                Engine                2",
$row_workorderlist['Location']))) {echo "SELECTED";}
```

```
?>>Auxiliary Engine 2</option>
            <option value="Auxiliary Engine 3" <?php if
(!(strcmp("Auxiliary Engine 3",
$row_workorderlist['Location']))) {echo "SELECTED";}
?>>Auxiliary Engine 3</option>
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">System:</div></td>
          <td><select name="System">
            <option value="Non System" <?php if (!(strcmp("Non
System", $row_workorderlist['System']))) {echo "SELECTED";}
?>>Non System</option>
            <option value="Fuel Oil System" <?php if
(!(strcmp("Fuel Oil System", $row_workorderlist['System'])))
{echo "SELECTED";} ?>>Fuel Oil System</option>
            <option value="Lub Oil System" <?php if
(!(strcmp("Lub Oil System", $row_workorderlist['System'])))
{echo "SELECTED";} ?>>Lub Oil System</option>
            <option value="Cooling Water System" <?php if
(!(strcmp("Cooling Water System",
$row_workorderlist['System']))) {echo "SELECTED";}
?>>Cooling Water System</option>
          </select>          </td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Description:</div></td>
          <td><textarea name="description" cols="20"><?php
echo $row_workorderlist['description']; ?></textarea></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Schnumber:</div></td>
```

```
          <td><select name="Schnumber">
            <?php
do {
?>
            <option value="<?php echo
$row_maintenanceactvity['SchNumber']?>" <?php if
(!(strcmp($row_maintenanceactvity['SchNumber'],
$row_workorderlist['Schnumber']))) {echo "SELECTED";}
?>><?php echo
$row_maintenanceactvity['SchNumber']?></option>
            <?php
} while ($row_maintenanceactvity =
mysql_fetch_assoc($maintenanceactvity));
?>
          </select> </td>
        <tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">MaintenanceAct:</div></td>
          <td><textarea name="MaintenanceAct"
cols="20"><?php echo $row_workorderlist['MaintenanceAct'];
?></textarea></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">Sparepart:</div></td>
          <td><textarea name="Sparepart" cols="20"><?php echo
$row_workorderlist['Sparepart']; ?></textarea></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">QtyAvailable:</div></td>
          <td><input type="text" name="QtyAvailable"
value="<?php echo $row_workorderlist['QtyAvailable']; ?>"
size="8"></td>
```

```
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">EmployeeName:</div></td>
          <td><input type="text" name="EmployeeName"
value="<?php echo $row_workorderlist['EmployeeName']; ?>"
size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div
align="left">EmployeeNumber:</div></td>
          <td><input type="text" name="EmployeeNumber"
value="<?php echo $row_workorderlist['EmployeeNumber']; ?>"
size="20"></td>
        </tr>
        <tr valign="baseline">
          <td nowrap align="right"><div align="left"></div></td>
          <td><input type="submit" value="Update"></td>
        </tr>
      </table>
      <input type="hidden" name="MM_update" value="form1">
      <input type="hidden" name="WO_Number" value="<?php
echo $row_workorderlist['WO_Number']; ?>">
    </form>
   <p> </p></td>
  </tr>
</table>
<p align="justify"> </p>
</body>

</html>
<?php
mysql_free_result($itemlist);

mysql_free_result($maintenanceactvity);
```

```
mysql_free_result($workorderlist);
?>
```

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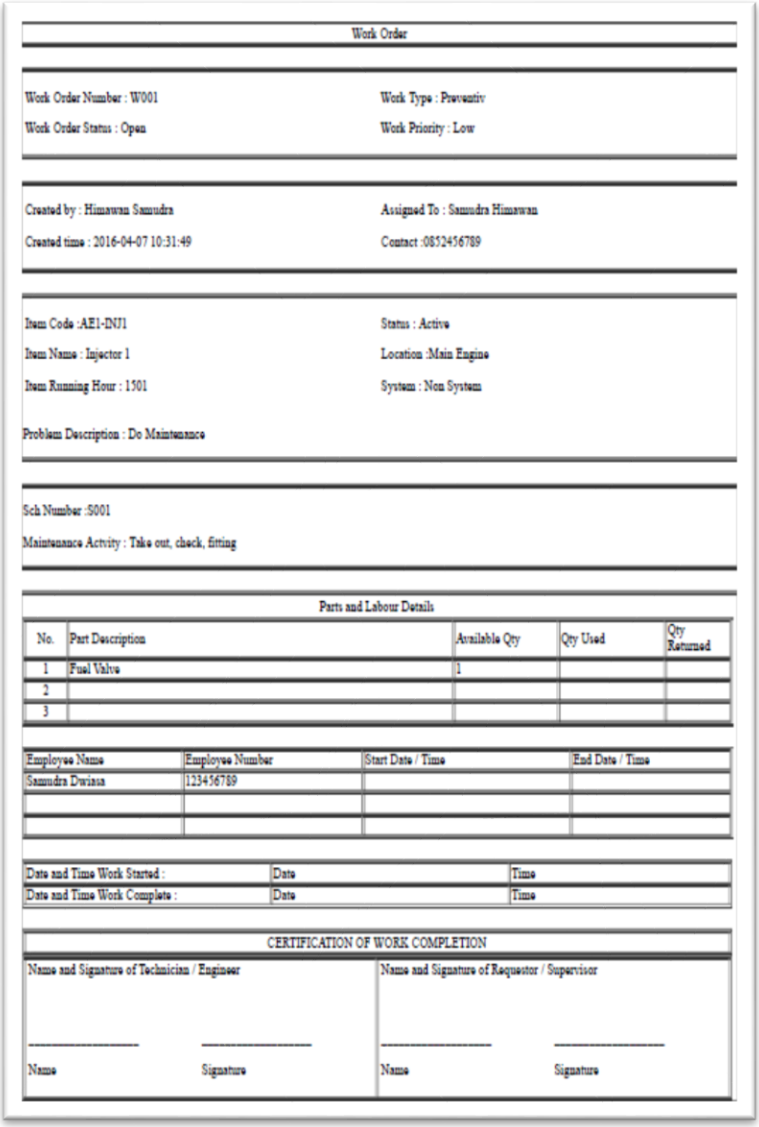
Enclosure 5.23 Print Work Order Form



Work Order

Work Order Number : W001
Work Type : Prwentiv
Work Order Status : Open
Work Priority : Low

Created by : Himawan Samudra
Assigned To : Samudra Himawan
Created time : 2016-04-07 10:31:49
Contact :0852456789

Item Code :AE1-INJ1
Status : Active
Item Name : Injector 1
Location :Main Engine
Item Running Hour : 1501
System : Non System

Problem Description : Do Maintenance

Sch Number :5001

Maintenance Actvity : Take out, check, fitting

Parts and Labour Details

No.	Part Description	Available Qty	Qty Used	Qty Returned
1	Fuel Valve	1		
2				
3				

Employee Name	Employee Number	Start Date / Time	End Date / Time
Samudra Dwiasa	123456789		

Date and Time Work Started :	Date	Time
Date and Time Work Complete :	Date	Time

CERTIFICATION OF WORK COMPLETION

Name and Signature of Technician / Engineer		Name and Signature of Requestor / Supervisor	
Name	Signature	Name	Signature

```
<?php require_once('Connections/maintenance.php'); ?>
<?php
$colname_workorder = "-1";
if (isset($_GET['WO_Number'])) {
  $colname_workorder = (get_magic_quotes_gpc()) ? $_GET['WO_Number'] : addslashes($_GET['WO_Number']);
}
mysql_select_db($database_maintenance, $maintenance);
$query_workorder = sprintf("SELECT * FROM workorder WHERE WO_Number = '%s'", $colname_workorder);
$workorder = mysql_query($query_workorder, $maintenance) or die(mysql_error());
$row_workorder = mysql_fetch_assoc($workorder);
$totalRows_workorder = mysql_num_rows($workorder);
?><!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>Untitled Document</title>
</head>

<body>
<?php do { ?>
</table>
<table width="995" border="1">
  <tr>
    <td width="985"><div align="center">Work Order </div></td>
  </tr>
</table>
<table width="995" border="0">
  <tr>
```

```
    <td width="984" height="1"> </td>
  </tr>
</table>
<table width="995" border="1">
  <tr>
    <td width="995"><table width="984" border="0">
      <tr>
        <td width="487"><p>Work Order Number : <?php echo
$row_workorder['WO_Number']; ?></p>
          <p>Work Order Status : <?php echo
$row_workorder['Wo_Status']; ?></p></td>
        <td width="487"><p>Work Type : <?php echo
$row_workorder['Work_type']; ?></p>
          <p>Work Priority : <?php echo
$row_workorder['Work_Priority']; ?></p></td>
      </tr>
    </table></td>
  </tr>
</table>
<table width="995" border="0">
  <tr>
    <td> </td>
  </tr>
</table>
<table width="995" border="1">
  <tr>
    <td><table width="986" border="0">
      <tr>
        <td width="488"><p>Created by : <?php echo
$row_workorder['Createdby']; ?></p>
          <p>Created time : <?php echo
$row_workorder['createdtime']; ?></p></td>
        <td width="488"><p>Assigned To : <?php echo
$row_workorder['Assignedto']; ?></p>
          <p>Contact :<?php echo $row_workorder['Contact'];
```

```
?></p></td>
     </tr>
   </table></td>
  </tr>
</table>
<table width="995" border="0">
  <tr>
   <td> </td>
  </tr>
</table>
<table width="995" border="1">
  <tr>
   <td><table width="984" border="0">
     <tr>
      <td width="488"><p>Item Code :<?php echo
$row_workorder['itemcode']; ?></p>
       <p>Item Name : <?php echo
$row_workorder['ItemName']; ?></p>
       <p>Item Running Hour : <?php echo
$row_workorder['itemworkhour']; ?></p></td>
      <td width="486"><p>Status : <?php echo
$row_workorder['itemStatus']; ?></p>
       <p>Location :<?php echo $row_workorder['Location'];
?></p>
       <p>System : <?php echo $row_workorder['System'];
?></p></td>
     </tr>
   </table>
   <p>Problem Description : <?php echo
$row_workorder['description']; ?></p></td>
  </tr>
</table>
<table width="995" border="0">
  <tr>
   <td> </td>
```

```
  </tr>
</table>
<table width="995" border="1">
  <tr>
    <td><p>Sch Number :<?php echo $row_workorder['Schnumber']; ?></p>
      <p>Maintenance Actvity : <?php echo $row_workorder['MaintenanceAct']; ?></p></td>
  </tr>
</table>
<table width="900" border="0">
  <tr>
    <td> </td>
  </tr>
</table>
<table width="995" border="1">
  <tr>
    <td width="1005" height="549"><table width="978" border="0">
      <tr>
        <td width="972"><div align="center">Parts and Labour Details </div></td>
      </tr>
    </table>
      <table width="979" border="1">
        <tr>
          <td width="54"><div align="center">No. </div></td>
          <td width="527">Part Description </td>
          <td width="139">Available Qty </td>
          <td width="141">Qty Used </td>
          <td width="84">Qty Returned </td>
        </tr>
        <tr>
          <td><div align="center">1</div></td>
          <td><?php echo $row_workorder['Sparepart']; ?></td>
```

```
        <td><?php echo $row_workorder['QtyAvailable']; ?></td>
        <td> </td>
        <td> </td>
      </tr>
      <tr>
        <td><div align="center">2</div></td>
        <td> </td>
        <td> </td>
        <td> </td>
        <td> </td>
      </tr>
      <tr>
        <td><div align="center">3</div></td>
        <td> </td>
        <td> </td>
        <td> </td>
        <td> </td>
      </tr>
    </table>
    <table width="978" border="0">
      <tr>
        <td width="972"> </td>
      </tr>
    </table>
    <table width="979" border="1">
      <tr>
        <td width="213">Employee Name </td>
        <td width="243">Employee Number </td>
        <td width="281">Start Date / Time </td>
        <td width="214">End Date / Time </td>
      </tr>
      <tr>
        <td><?php      echo      $row_workorder['EmployeeName'];
?></td>
        <td><?php     echo     $row_workorder['EmployeeNumber'];
```

```
?></td>
        <td> </td>
        <td> </td>
      </tr>
      <tr>
        <td> </td>
        <td> </td>
        <td> </td>
        <td> </td>
      </tr>
      <tr>
        <td> </td>
        <td> </td>
        <td> </td>
        <td> </td>
      </tr>
    </table>
    <table width="978" border="0">
      <tr>
        <td width="991"> </td>
      </tr>
    </table>
    <table width="978" border="1">
      <tr>
        <td width="332">Date and Time Work Started :</td>
        <td width="320">Date</td>
        <td width="295">Time</td>
      </tr>
      <tr>
        <td>Date and Time Work Complete : </td>
        <td>Date</td>
        <td>Time</td>
      </tr>
    </table>
    <table width="978" border="0">
```

```
    <tr>
      <td width="956"> </td>
    </tr>
  </table>
  <table width="978" border="1">
    <tr>
      <td width="970"><div align="center">CERTIFICATION
OF WORK COMPLETION </div></td>
    </tr>
  </table>
  <table width="978" border="1">
    <tr>
      <td width="481"><table width="481" border="0">
        <tr>
          <td width="471">Name and Signature of Technician /
Engineer </td>
        </tr>
      </table>
        <table width="479" border="0">
          <tr>
            <td width="232"><p> </p>
            <p>_____</p>
            <p>Name</p></td>
            <td width="231"><p> </p>
              <p>_____</p>
            <p>Signature</p></td>
          </tr>
        </table>          </td>
      <td width="481"><table width="481" border="0">
        <tr>
          <td width="471">Name and Signature of Requestor /
Supervisor </td>
        </tr>
      </table>
        <table width="479" border="0">
```

```
            <tr>
              <td width="232"><p> </p>
                <p>_____</p>
              <p>Name</p></td>
              <td width="231"><p> </p>
                <p>_____</p>
              <p>Signature</p></td>
            </tr>
          </table>
        </td>
      </tr>
    </table>
  </td>
 </tr>
</table>
<p> </p>
<p> </p>
</body>
  <?php } while ($row_workorder = mysql_fetch_assoc($workorder)); ?>
</html>
<?php
mysql_free_result($workorder);
?>
```

CHAPTER V
CONCLUSION & SUGGESTION

5.1. Conclusion

Based on the result from this final project, the writer concludes several conclusions as mention below:

1. Web based maintenance provide the maintenance frequency with reminder system to make sure the maintenance can be held on the right time, so the overlapping maintenance time can be avoided.
2. To design decision support, the web based maintenance featured with reminder system that combined with voyage plan and work hour to make a recommendation when the maintenance time comes. To help decision making, there is a risk level and the consequence of each maintenance activity if the component fail, to help decision making.

5.2. Suggestion

The suggestion from the result of this final project for the next research are:

1. Need to add more features to make web based maintenance not only for maintenance purpose but also can connect with the another aspect of the ship and its company. Because maintenance will be the crucial aspect not only for the maintenance itself but also for the different aspect of the company.
2. Need to develop with another programming language beside of PHP and HTML, to make the web more alive and easier to be accessed.

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BIBLIOGRAPHY

[1] Australian Maritime Safety Authority. **Risk Management in The National System a Practical Guide**. Canberra city ACT 2601.

[2] British Standard. **Maintenance – Document for Maintenance**. BS EN 13460: 2002.

[3] Calder, Nigel. 1992. **Marine Diesel Engines Maintenance, Troubleshooting and Repair Second Edition**. International Marine Camden, Maine.

[4] Compton, Peter. 1998. **Troubleshooting Marine Diesels**. International Marine Camden, Maine.

[5] Delisle, Marc. 2012. **Mastering PHPmyadmin 3.4 for Effective MySQL Management.** Packt Publishing, Ltd.

[6] DNV-GL. **Maritime Software Brochure**.

[7] Ebeling, C.E. 1997. **An Introduction to Reliability and Maintainability Engineering**. The McGraw-Hill Company, Singapore.

[8] Gupta, Hitesh. 2011. **Management Information System (An Insight).** International Book House PVT. Ltd., New Delhi.

[9] **Germanischer Lloyd Rules and Guidelines Edition 2013**.

[10] Heijden, Hans Van Der. 2009. **Designing Management Information System**. Oxford University Press Inc., New York.

[11] Hove, Sue, & Booth, Donald S. 2006. **Macromedia Dreamweaver 8 Certified Developer Study Guide**. Adobe Press.

[12] **Risk based maintenance and consequence classification**. Norsok Z-008, 2011

[13] Powers, David. 2014. **PHP Solutions: Dynamic Web Design Made Easy Third Edition**. Apress.

[14] Scott, George M. 1986. **Principles of Management Information System**. McGraw Hill.

[15] Valade, Janet. 2010. **PHP and MySQL for Dummies, 4th Edition**. Wiley Publishing, Inc.

[16] Wireman, Terry. 2003. **Benchmarking Best Practice in Maintenance Management**. Industrial Press Inc., New York.

[17] Wireman, Terry. 2010. **Developing Performance Indicator for Managing Maintenance**. Industrial Press Inc., New York.

BIOGRAPHY

The author was born on January 10th, 1995 with the full name was Himawan Samudra Dwiasa. The author was the second child of three children from the couple of Mr. Basuki Hidayat and Mrs. Laksmi Gamawati. The author began his studies in kindergarten of Lembah Jaya. Then continued to SDN Setiadarma 01, graduated on 2006. On the 2006 - 2009 the author continued his study to the SLTP N 1 Tambun Selatan. Then continued his education to the SMU N 1 Tambun Selatan, Bekasi in the 2009 -2012. After graduated from the Senior High School, he continued to the college on Departement of Marine Engineering, Faculty of Marine Technology, ITS Surabaya at 2012 with student register 4212101009. The author finished his bachelor program at 2016, he took the Final Project on the Reliability, Availability, Maintainability and Safety (RAMS) Laboratory with the title "*Web Based Maintenance as Decision Support for Preventive Maintenance*".

Positive Mental Attitude.

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