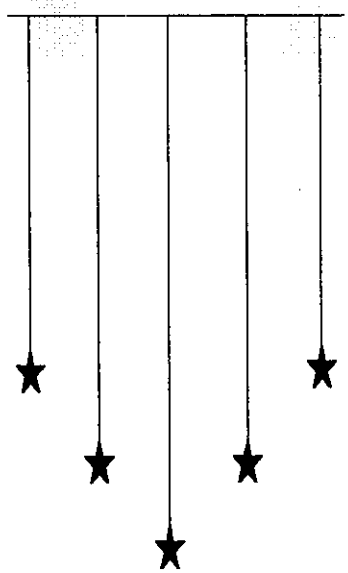
# Facility Management System

P-940

## PROJECT REPORT

**Submitted in partial fulfillment of the requirements for award of degree**

**M.Sc.,[Applied Science] Software Engineering**




**Submitted By**

**J.Suresh Kumar**

**9837S0068**


UNDER THE GUIDANCE OF,

| External Guide | Internal Guide |
|---|---|
| Mr. Subramanian | Mr.K.Karthikeyan |
| System Administrator, | Lecturer, |
| **CB Richard Ellis** | CSE Department |


**Department Of Computer Science and Engineering**

**Kumaraguru College Of Technology**

**(Affiliated to Bharathiar University)**

**Coimbatore-641006.**

# CERTIFICATE

INTERNATIONAL PROPERTY
CONSULTANTS

**CB Richard Ellis**

CB Richard Ellis South Asia Pvt. Ltd.
First Floor
Tidel Park limited
# 4, Canal Bank Road
Taramani, Chennai -600 113
T/F 254 0400/ 01/ 02 T.Int.502
tidel@cbre.com.hk

29 March 2003

Reference No: CBRE/TD/

To

**The Head of Department**
**Kumaraguru College of Technology**
**Coimbatore -641006**

**Dear Madam/Sir,**

**Sub:** Internship Training.

This is with reference to our letter pertaining to the Internship training of your student Mr.J.Suresh kumar at our office .

He has been assigned the following Facilities Management modules.

- Helpdesk.
- Materials Management.
- General Administration

The project is expected to be finished by 3rd week of April 03. This is for your information and records.

Thanking you

Yours Faithfully

For CB RICHARD ELLIS,

B.Ravi
General Manager

# CERTIFICATE

Department of Computer Science and Engineering
**Kumaraguru College of Technology**
Coimbatore-641 006

This is to certify that the project work entitled "Facility Management System" has been submitted by

Mr. J. Suresh Kumar

In partial fulfillment of the award of the degree of
Master of Science in Applied Science-Software Engineering
Bharathiar University, Coimbatore
during the academic year 2002-2003

Internal Guide

Head of the Department

Certified that the candidate was examined by us in the Project Work Viva Voce Examination held on 7/4 and the University Register Number is 98378068

Internal Examiner

External Examiner

# ACKNOWLEDGEMENT

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I wish to express my thanks to my beloved **Parents** without whom I can't do the project and helped me in getting the project in this company by providing all kind of help from knowledge to finance.

I am bound to express my gratitude to **Dr. K.K Padmanabhan B.Sc (Engg), M.Tech. Ph.D.** Principal, Kumaraguru College of Technology, Coimbatore for his assistance in getting the project work.

I wish to express my grateful thanks to **Dr. S. Thangasamy Ph.D.** Prof. & Head of the Department, and our course-coordinator **Mrs. S. Devaki B.E.M.S, Asst. Prof.** and my internal guide **Mr. K. Karthikeyan MSc.** Lecturer, Department of Computer Science and Engineering, Kumaraguru College of Technology, Coimbatore for constantly encouraging me to pursue new goals and ideas and have given their tremendous guidance and suggestions throughout the project.

I express my sincere thanks to **Mr. Nageshwaran** and **Mr. Subramanian** System administrator, **CB Richard Ellis**, Tidal Park, Chennai for providing me this opportunity to do the project in this Company.

I express my profound gratitude and thanks to my external guides **Mr. Nageshwaran** and **Mr. Subramanian CBRE**, Chennai for the guidance they provided during the development of the project.

Iam proud of my **Family** for encouraging me whenever I was depressed, and improved my confidence to face the challenges in the life and have made the project a great success.

**J. Suresh Kumar**

# SYNOPSIS

Facility Management System

# SYNOPSIS

The project entitled Facility Management System has to automise the manual operations that are being followed by the company CB Richard Ellis. This Software has 7 modules. The modules called Help Desk, House Keeping, Material Management, Administration are the associated functions of the software. CBRE is a property maintenance company, which maintains the Tidal Park Building. The maintenance task is being done manually which takes lot of time to process and to maintain the documents and the records.

The Help Desk Module maintains a queue which contains a list of calls that are registered by the Tenants. The tenants may enquire the status of the call or may register a new call. Each call is then processed based upon the service type and a work order is then produced for each call. Each work order is then given to a contractor, who then proceeds with the work. After the work has been completed the work order will be closed and then removed from the queue.

Material Management module deals with the incoming and outgoing of the material. The material transaction has four functions, Material received, Material allocated, Material returned, Material rejected. It maintains a store table where all the materials will be stored during the transaction. This module has to generate a report that gives the total stock of a particular material, and the individual stock in each store.

House Keeping module support to schedule the house keeping activities, generate the checklist for each activity and to prepare a chart which shows the satisfaction range of each tenants those correspond to the area that are maintained by CBRE.

The Administration module deals with the parking management, auditorium and floor booking management. This module allows the user to allocate parking slots to the customers. It also displays the slots that are already booked and those that are not allocated to the customers. It allows the user to book auditorium and the floors for the customer. It generates a report that gives the dates for which the auditorium and floors are booked by the customers and the dates that are free.

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## CONTENTS

# INTRODUCTION

# 1. INTRODUCTION

## 1.1 COMPANY PROFILE

### About CB Richard Ellis

CB Richard Ellis - International

The World largest vertically integrated real estate service provider –implementing international management standards across the Globe

CB Richard Ellis was formed in May 1998 as a result of the merger of the world two largest real estate service providers, CB Commercial Inc and REI Ltd. Today the firm is the world's first truly global real estate consultant employing over 12,000 skilled people in all aspects of the property industry. Having its head office in Los Angeles, CB Richard Ellis has a network of offices in all the major economic centers of the world with offices in 30 countries, across six continents in 250 countries.

From advising on property transactions and investment, to undertaking valuation and appraisal services, from project management to development consultancy, from sales and leasing agency to real estate management, the firm has equipped itself to provide a uniquely integrated, professional and above all personal, international service to its clients.

### International Management Services

Acknowledged as being the world leader in the property management field with over 500 million square feet of prime property under management

CB Richard Ellis manages over 500 million square feet of the world's finest property worldwide comprising residential accommodation, commercial and industrial space. CB Richard Ellis is acknowledged as being the market leader in Property Management in Asia and acts as advisor to several academic institutions with regard to this area of the real Estate profession. In addition, CB Richard Ellis is the first and only Real Estate Consultant to be awarded ISO 9002 accreditation for its Property Management Services.

## CB Richard Ellis Management Services

A full contingent of management services designed to ensure maximum occupier satisfaction and real estate investment returns

The professional management of buildings in India is becoming more important as a result of the emphasis landowners are now placing on extracting rental returns from their properties. In the past, when capital value appreciation was the main priority and where a high proportion of that value was vested in the land, management services played an insignificant role. The arrival of MNC's, traditionally tenants and lessees, has tremendously changed the priorities of Landlords and developers. Property management is now seen as a key ingredient in the investment success of a real estate holding. The endeavor of CB Richard Ellis is to meet this challenge and to maximize the value of the client's property through active 'hands on' management.

CB Richard Ellis has assembled a highly talented group of property managers and support staff, blending an institutional perspective with a "hands on'', entrepreneurial approach, to assist its clients in taking advantage of the opportunities and responding to challenges. CB Richard Ellis is now poised to become the market leaders in professional property management in India.

## Early beginning, better results:

CB Richard Ellis are of the firm belief that successful management services can only be provided if a management company is employed pre-building completion. This provides the opportunity to advise the developer on important issues such as choice of finishing materials, methods of cleaning and so on. Nevertheless, if this is not possible, it is advantageous to commence management operations as early in the building's life as possible - to work out management methods and to allow sufficient time to implement same, thereby allowing the occupier to move in with the benefit of full management services in operation.

Each building whether residential, industrial or commercial presents a unique opportunity to provide management services to compliment its design and construction and the opportunity to improve occupational standards and investment return.

## Service Provided

CB Richard Ellis is able to provide all aspects of Professional Property Management services from a turnkey operation to general management consultancy on behalf of its clients. All areas as listed below are covered.

- General Building Administration
- Building Operation
- Preventative Building Maintenance
- Occupant Management
- Financial Control
- Real Estate Advice
- Investment Management

Any combination of the above services can be provided depending upon a building owner or occupant's requirements. Only by fully understanding the client's detailed requirements can we assess the type and level of service required.

## 1.2 PROBLEM DEFINITION

The Facility Management System has to atomies the maintenance of the house keeping records, material management and increases the efficiency of customer services using help desk. It helps the customer to check the status of his work registered; it also helps the CBRE staff to handle the records that are related to maintenance of the building.

The system has to do the following functions:

Interact with the customer in receiving the call registration, and to display the status about the call that has been registered by the tenant. Maintain a queue of the call that is registered by the tenants. Produce the work order based on the service type. Allocate the work order to the appropriate contractor. Close the work order if the contractor finishes the work.

Receive the work order from the help desk and to request the materials, equipments from the appropriate supplier. Deal with the material transaction like receiving material from the supplier, allocating material to the customer, receiving material returned from the customer, material rejected to the supplier, calculate the total and individual stock for the material and the store.

Facility Management System has to prepare schedule for the house keeping activities. It has to log the performance of the work done by the CBRE staff and the details about the work and the staff. It has to log the satisfaction range of the tenant, who belongs to the area where the house keeping activity is performed. It has to generate a chart showing the satisfaction range of each tenant in the building.

In case of administration it has to keep track on the parking slot allocation, and booking of the auditorium and the conference hall. It has to allow the user to view parking slots that are free and that are allocated to other persons.

It has to generate the report that displays the material transactions that are made on a particular date. Generate report that displays the calls that are closed and the calls that are in progress, on a given date.

# PROGRAMMING ENVIRONMENT

# 2. PROGRAMMING ENVIRONMENT

## 2.1 SYSTEM SPECIFICATION

### Software Requirements

**Server:**

WINDOWS NT 4.0

**Client:**

WINDOWS 98

### Hardware Requirements

| | |
|---|---|
| RAM | : 128MB RAM |
| Processor | : Intel Pentium 4 |
| Hard disk | : 10 GB |
| Mother board | : Intel chip set |
| Mouse | : Logitech |

## 2.2 OPERATING SYSTEM

### Windows

Windows supports multitasking that allows running more than one application at a time. It adds several features to the windows graphical application and significantly improves its efficiency. It provides a GUI tool that enables a layman to work in any application. Since a person who is not necessarily to be a computer operator and need not have very good computer knowledge frequently uses this Facility management System, the windows operating system is been selected for this system.

### Message Driven Architecture

Windows uses the message-handling concept for handling more than one application at a time. It maintains a message queue, which stores the messages send by the applications. The windows then process these messages individually. The queue is a memory portion that is not used by any other application. Visual Basic can run under windows platform, which can utilise the windows system tools efficiently.

### Routines Built into Windows

Windows contains some common features that are repeatedly used by all the application. The functions are like printing jobs, opening the existing files and many other features. These features are written as a routine inside the windows OS, which can be used by the program rather than writing separate code for these functions separately. This makes the programmer's job easier by reducing the code that has to be written instead. It also reduces the size of the program.

Visual Basic is a very comfortable tool that makes the developer job easier and efficient It is easy to develop software that is user friendly and which is going to interact with a person wh doesn't have much knowledge about the computer. Microsoft access is used as the backend for thi system during the development period. The back end is to be changed to SQL database after th whole system is developed. In that case the testing will be done on two stages, first is after th development of system with access as its backend and second is after the conversion of acces database to SQL database.

# SYSTEM STUDY AND ANALYSIS

# 3. SYSTEM STUDY AND ANALYSIS

## 3.1 HELP DESK

### 3.1.1 OBJECTIVE

The Help Desk is the central repository for all work requests, comments, CB Richard Ellis and customer reported problems. The Help Desk provides:

- A centralized system for the dispatch and management of work requests
- A centralized method of recording and monitoring work requests
- Measurement of performance of suppliers and those groups performing work
- Measurement of levels of resources provided for the FM team
- A customer satisfaction measure

Problems within the working environment distract the client's staff from their core business activities. CBRE is committed to reduce these distractions by adopting a proactive approach to problem identification and resolution. This proactive approach is supported by facility inspections, carried out by the Facility Management Team and CBRE's suppliers on site.

The Facilities Team is to perform periodic inspections of the building and grounds, record deficiencies and pass work requests to the Help Desk Operator. The procedure controlling this exercise is contained within the operation and maintenance function, which contains all the work instructions.

The CBRE suppliers are to be encouraged to report on deficiencies observed within the building and grounds to the Help Desk. A key performance indicator for this pro-active approach is the comparison between the client's work order volumes and those reported by the CBRE team and suppliers. Clearly the aim is to have CBRE FM staff work order volumes significantly greater than those generated by the supplier.

## 3.1.2 HELP DESK FUNCTION

The following sections provide detailed work instructions on receiving and logging work requests. The instructions are intended for use by for the Help Desk operator. They are to be followed to ensure that the service provided to the Client for Help Desk operation and the subsequent processing of work requests is repeatable and consistent in its approach and delivery.

### 1. RECEIVING AND LOGGING WORK REQUESTS

It is the intent that all work requests without exception for CBRE FM operations should be logged centrally at the Facility Management Database. It is the intent that work requests for services not provided by CBRE should be re-directed to the appropriate client help desk for action. The redirection of the work request should be logged as an activity.

Work requests can be received from a number of sources:

1. Business Unit customers residing at the building
2. CBRE Facilities Team
3. CBRE suppliers working in support roles at the facility, e.g., catering, cleaning, security etc.

Work requests can be received in a number of ways: -

1. By direct telephone call
2. By telephone call voice mail message
3. E-mail
4. Verbal

### 2. AUTHORIZING WORK ORDERS PRIOR TO DESPATCH

Before any work order received can be despatched for action, it must first be reviewed to determine whether the work order requires management approval. Before despatching work orders to the action it is required that the Help Desk

Operator determines that the request is either: -

- Within the scope of CBRE service to the client
- Outside the scope of CBRE service to the client
- Within the agreed budget that CBRE manages on behalf of the client

- Outside the agreed budget that CBRE manages on behalf of the client
- Is a life safety or emergency action request

**Work Orders Fall within Scope of CBRE's Service with the Client**

The help desk operator can dispatch work orders for action without further authorisation if they are detailed within: -

- The scope of CBRE's service to the Client
- The Service Level Agreement (SLA)
- The agreed budget that CBRE manages on behalf of the client
- Requests that are of a Life Safety or Emergency are to be taken into consideration immediately, e.g.: Fire, Flood, Power outage, Lift extraction, Accident, First Aid

**Work Orders Fall outside the Scope of CBRE's Service for the Client:**

The help desk operator is to determine work requests that fall outside of the scope of CBRE's agreement with the client and hence will require CBRE management intervention:

- Those requests not included within the scope of service to the client
- Those requests that are not allowed for within the agreed budget that CBRE manages on behalf of the client

The help desk operator is to review these work requests with the CBRE on-site manager for authorisation prior to dispatch.

## 3. PROCESSING AND CLOSING WORK ORDER REQUESTS

Work orders can be dispatched to a number of parties for works to be carried out and completed. Contractors are

- CBRE service providers
- CBRE on-site staff for self performance

CBRE Service Providers receives the work order and identifies the corresponding work instruction from the system instructions. CBRE on-site staff receives the work order and find the corresponding work and the CBRE staff who is responsible to carry out the work, from the system instruction. It is also essential that the originator of the work request be informed of how long it will take for the work to be completed. The help desk operator has to determine the time at which the work is to be carried out, from the CBRE supplier or CBRE staff member.

**Closing Work Order**

It is essential that the originator of the work request is informed when the work has been completed and also to the Help Desk operator.

It is essential that work order be closed with the originator. The help desk operator is required to call the originator to enquire if the work has been completed to their satisfaction. If the response is yes then the work order is closed. If the response is no, then the work order is not closed and the issue is to be escalated to the CBRE On-site Manager.

## 3.2 MATERIAL MANAGEMENT

**Purpose:** The material management forms a connecting link for various other modules such as the help desk, ppm and administration modules. It basically comes under the purchase department that is governed by purchase orders and work orders. It deals with the material transaction between stores, customers and suppliers.

**Functions**: Material Management includes the following functions:

- **Material received:** It is a transaction that is made during the process of receiving material from the supplier. This operation is governed by the purchase order.

- **Material allocation:** Material allocation is a process done by the CBRE team and the purpose is to allocate the required materials to the work site based upon the request of the customer. This allocation is done according to the work order.

- **Material Issue:** Once the materials are allocated they are then forwarded for the delivery to the allocated customer.

- **Material Return:** The customer may return some material back to CBRE due to the defects or due to the excess of the material, which is then transferred to a store.

- **Material Reject:** CBRE rejects some or all of the materials to the supplier due to defects or excess of the material.

- Current stock calculation of any particular material and its store location at a particular date is carried out at any given time. Each transaction deals with the store, which maintains the stock.

- Stock transfer of material between stores and individual bin locations is another important feature of this module that enables the stores to be properly maintained.

## 1.3 HOUSE KEEPING

**Purpose:** This module facilitates the user to schedule the work for house keeping activities. It logs the performance details and staff details those who perform the house keeping activities. It also generates a chart showing the satisfaction range of the work.

**Functions:** House keeping functions are

- **Schedule:** This function helps the user to schedule the house keeping activities for a particular month for selected areas. It adds the dates at which a particular activity is to be performed, frequency of the activity. Frequency ranges as daily, weekly, monthly, and fortnightly. User should select the dates at which the house keeping activities should be performed if the frequency is other than "Daily". It also helps to schedule the pest control activities.

- **Check List:** It allows the user to log the details about the activities that corresponds to house keeping for a particular day. It also facilitates to store staff details, and the customer satisfaction details, which will be stored in a database.

- **Log:** This option allows the user to view the chart for the customer satisfaction for a particular date. This chart shows the individual customer satisfaction range by getting the data from the database.

- **Reports:** The reports that are generated for this module are
  - Display Activities that are to be carried out in a particular date, given as input by the user.
  - Display the details about staff those who performed the activities for a particular date, given as input by the user.

## 1.4 ADMINISTRATION

This module is developed to facilitate the parking management and the booking management process. It also automise the manual process of allocating, canceling and altering the parking slots to the customer.

**PARKING MANAGEMENT**

This function deals with allocating, canceling, altering of the parking slots to the customer. It also deals with adding of new slots to the building. When a user wants to allocate a requested slot, he verifies whether it is allocated already, by simply viewing the frame that displays the slots that are present in the building. The frame shows all the slots that are filled and that are not filled. The user can then select the available slot for the specified time duration.

Parking slots are divided into two parts:

- Parking slot for two-wheeler
- Parking slot for car

The user can select any type of slot according to the type of the vehicle.

New parking area and slots can be added as a record to the database, which also can be displayed during the slot allocation

**BOOKING MANAGEMENT**

This function increases the efficiency and reduces facility management cost, creates demand notices, raises invoice and stores the maintenance reports.

It deals with booking of the following areas:

Auditorium

Conference Hall

Promotional Areas

Swimming Pool

Playing Area

The user can use this function to book an area for a particular day and time, and also can print the bill for that booking. The billing rate varies for each area, and based upon the type of area the corresponding bill will be generated for the customer. This function allows the user to add new areas and the corresponding fees for that area, so that user is allowed to book the new area for the customer. It also deals with the provision of the access cards to the customer, which generates the bill to the customers. It also generates a report that displays the dates in which auditorium, conference hall are booked and the dates that are free, which enables the user to easily identify the free dates.

The other two areas called swimming pool and playing area are allowed for more than one person, which has a limit. When that limit is exceeded then the corresponding area cannot be allocated to other customers till the end of the duration. In this case the report adds a column, which displays the number of persons booked swimming pool or playing area and the remaining capacity of the area.

**Input:** Client Details

Event and Area details

**Output:**

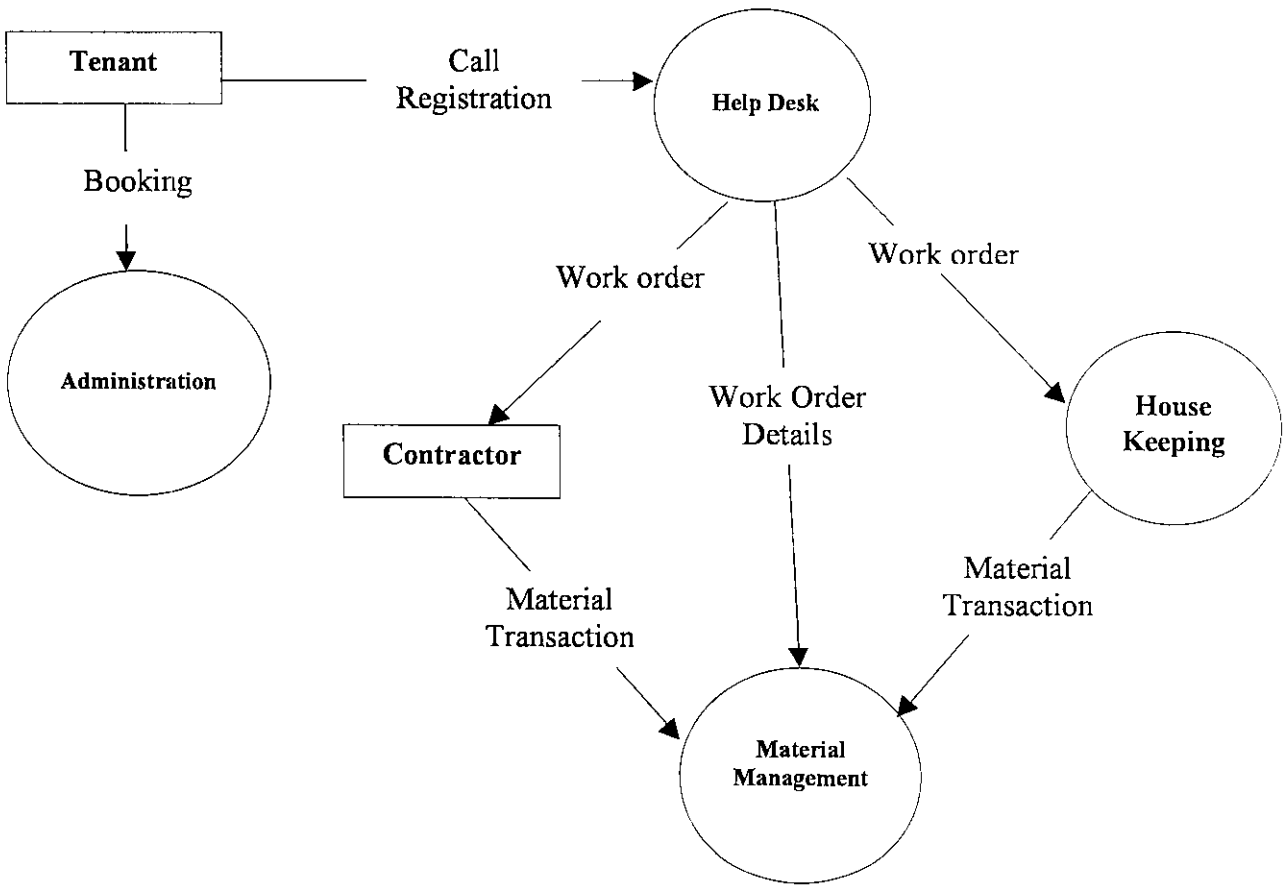
Invoices, Reports, schedule chart

# SYSTEM DEVELOPMENT

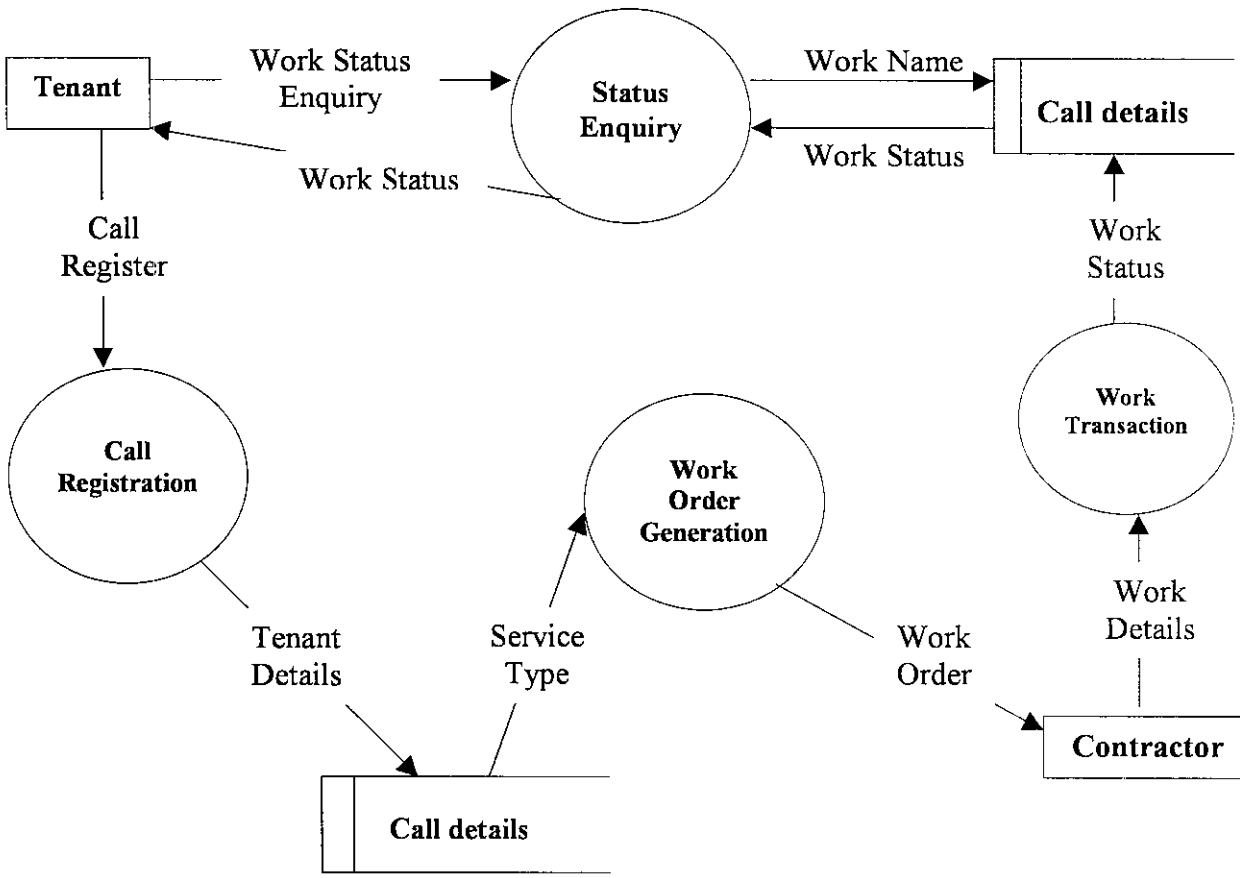
# 4. SYSTEM DEVELOPMENT

## 4.1 SYSTEM DESIGN

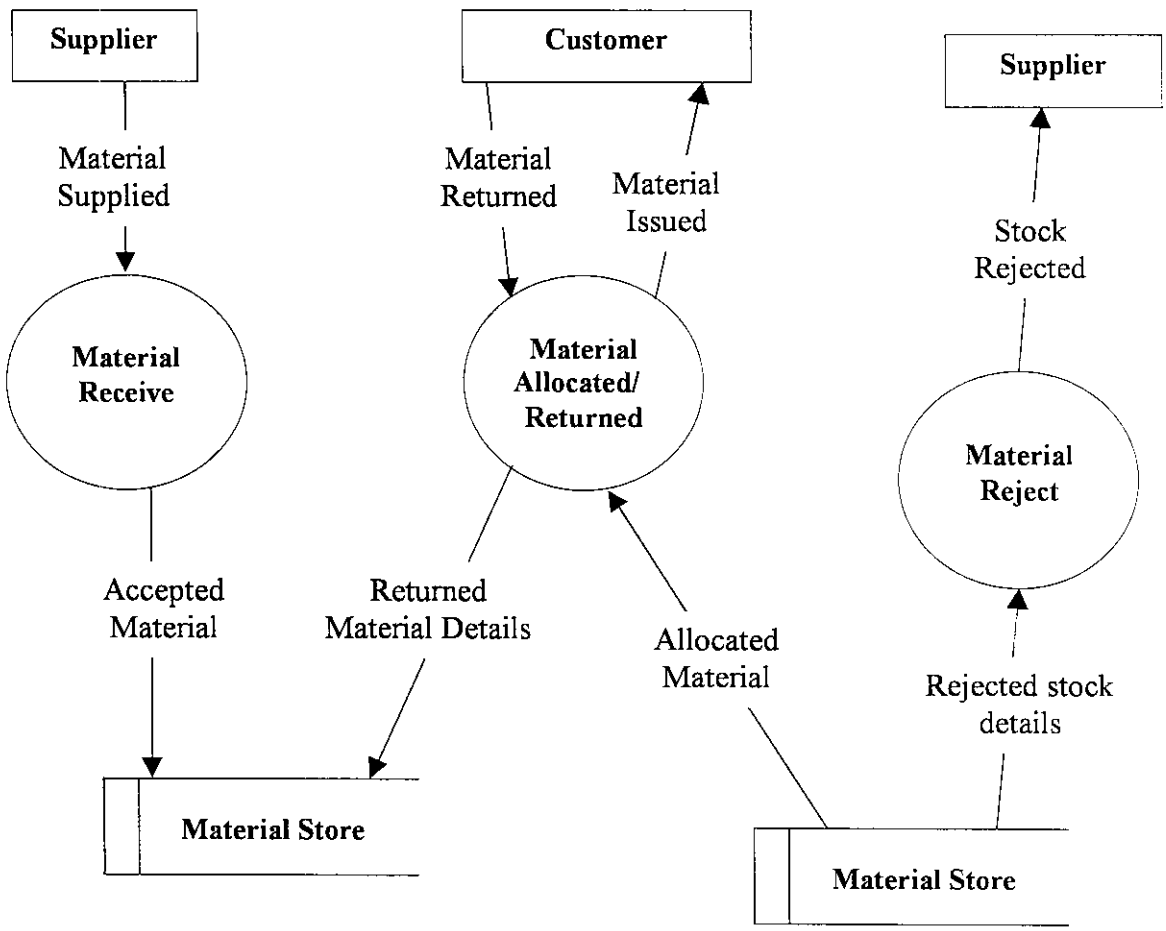
**Data flow between modules:**



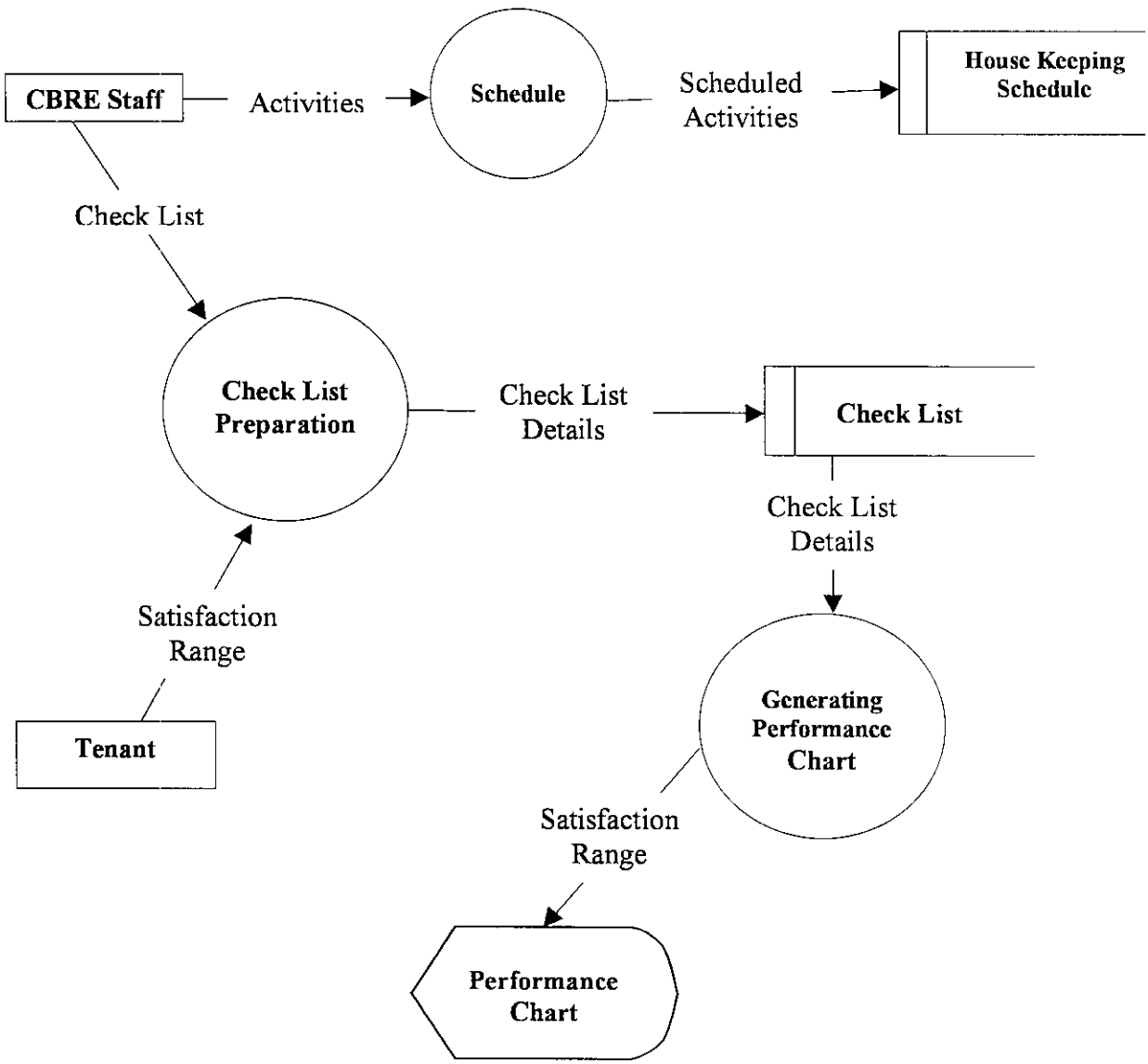
**Data flow for Help desk:**



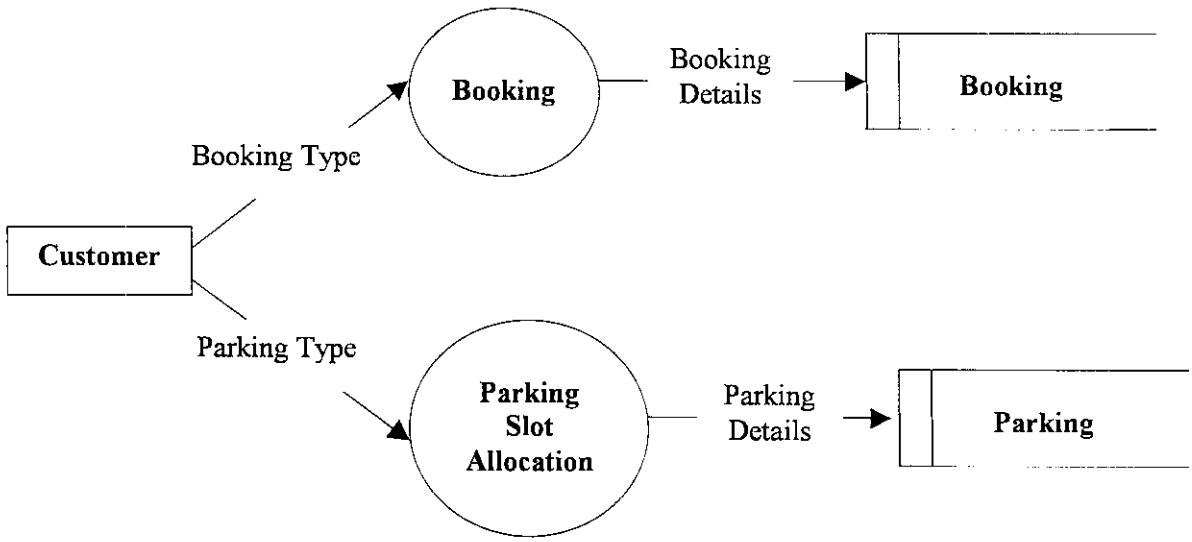
**Data flow for Material Transaction:**



**Data flow for House Keeping:**



**Data flow for Administration:**



## 4.2 ADVANTAGES OF NEW SYSTEM

Existing system handles the maintenance of the building using excel sheet and manually entering data into it. It stores the records in the excel sheet and also maintains in hard copy paper. The data stored in existing system is not securable. It is not easy to generate report using existing system.

**Help Desk**

- This module directly Interacts with the tenants in registering the call and in checking the status of the call.
- By using this module the tenant need not spend much time in registering a call. He can use the mail to inform the help desk operator about the call and its type and also about the necessity of the call, or he can directly register his call using the help desk.
- He can then check the status of the call registered by him, which, in existing system he has to ask the concerned person which is a timely process.

**Material Management**

- Using this module the user can easily record all the material transaction and that are made on a particular day.
- He can view the stock of a particular material in each individual store by a simple process of entering the material name for which the user wants to view the stock.
- It is easy to print a report of the stock details for a particular material.
- It is possible to generate the transaction details for a particular date by simply selecting the date.

**House Keeping**

- It entirely automates the manual process of scheduling the house keeping activities and maintains the logbook details safely.
- It is possible to generate the chart showing the satisfaction range of each tenant in the building. Using this chart the superior staff can check the performance of staff working under him and can improve the efficiency of house keeping activities.

- It reduces the job of maintaining the records, consumes less time for scheduling the house keeping activities.

**Administration**

- It reduces the time for allocating the parking slots to customers. It displays all the slots that are free and that are not free, which increases the efficiency of the user job.
- The user is able to select the slot by simply viewing the slot details.
- In case of booking the auditorium and conference hall it minimizes the job of checking the huge records by allowing the user to select the available dates from the list of dates displayed by the system.

## 4.3 SAMPLE INPUT AND OUTPUT SCREENS

### HOUSE KEEPING

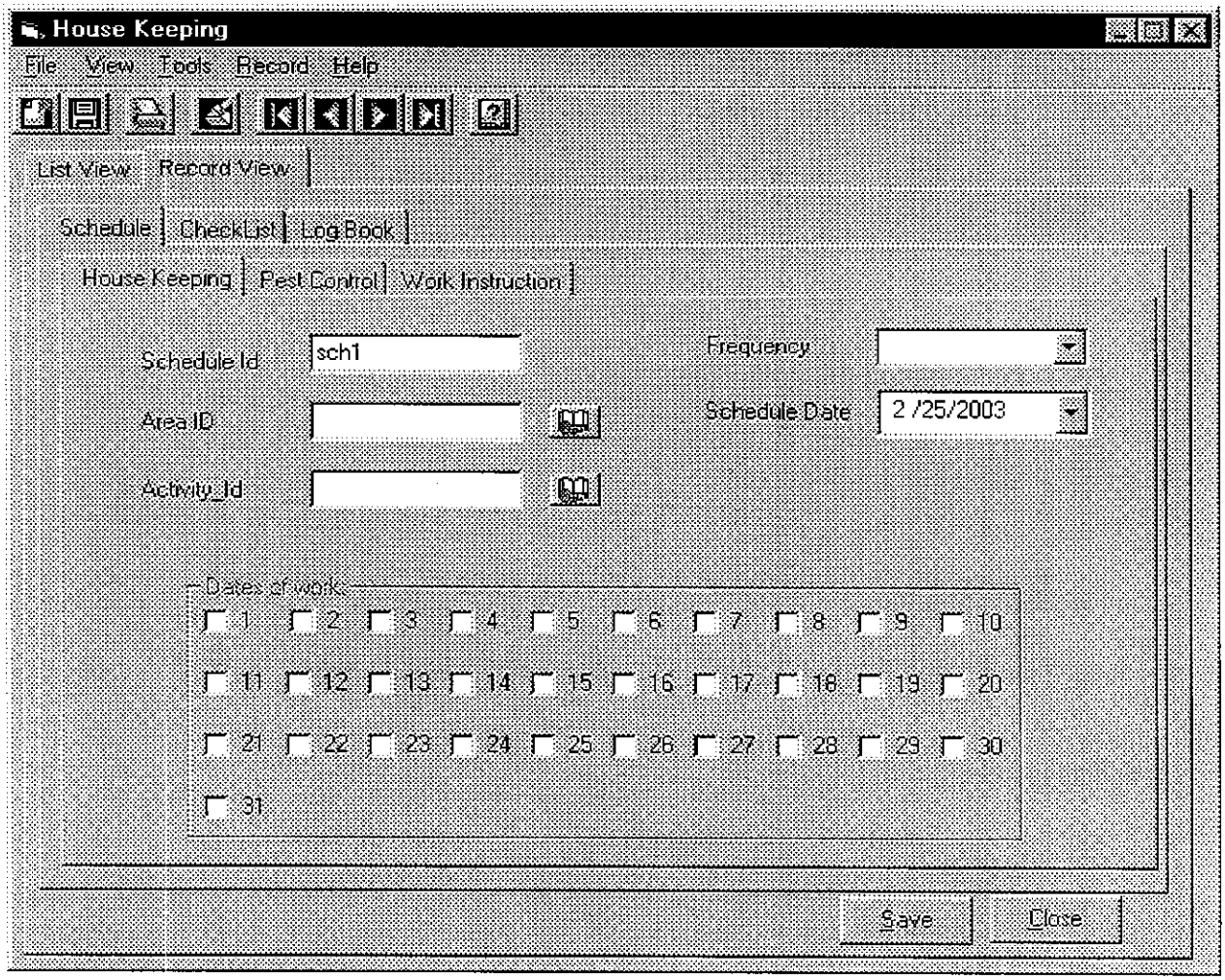



**Fig-1: Form for scheduling the House Keeping activities.**

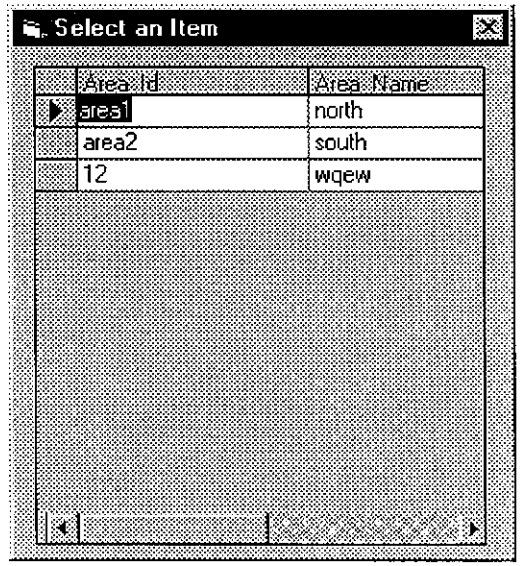



**Fig-2: Form that allows the user to select the area and activity item from the existing data.**

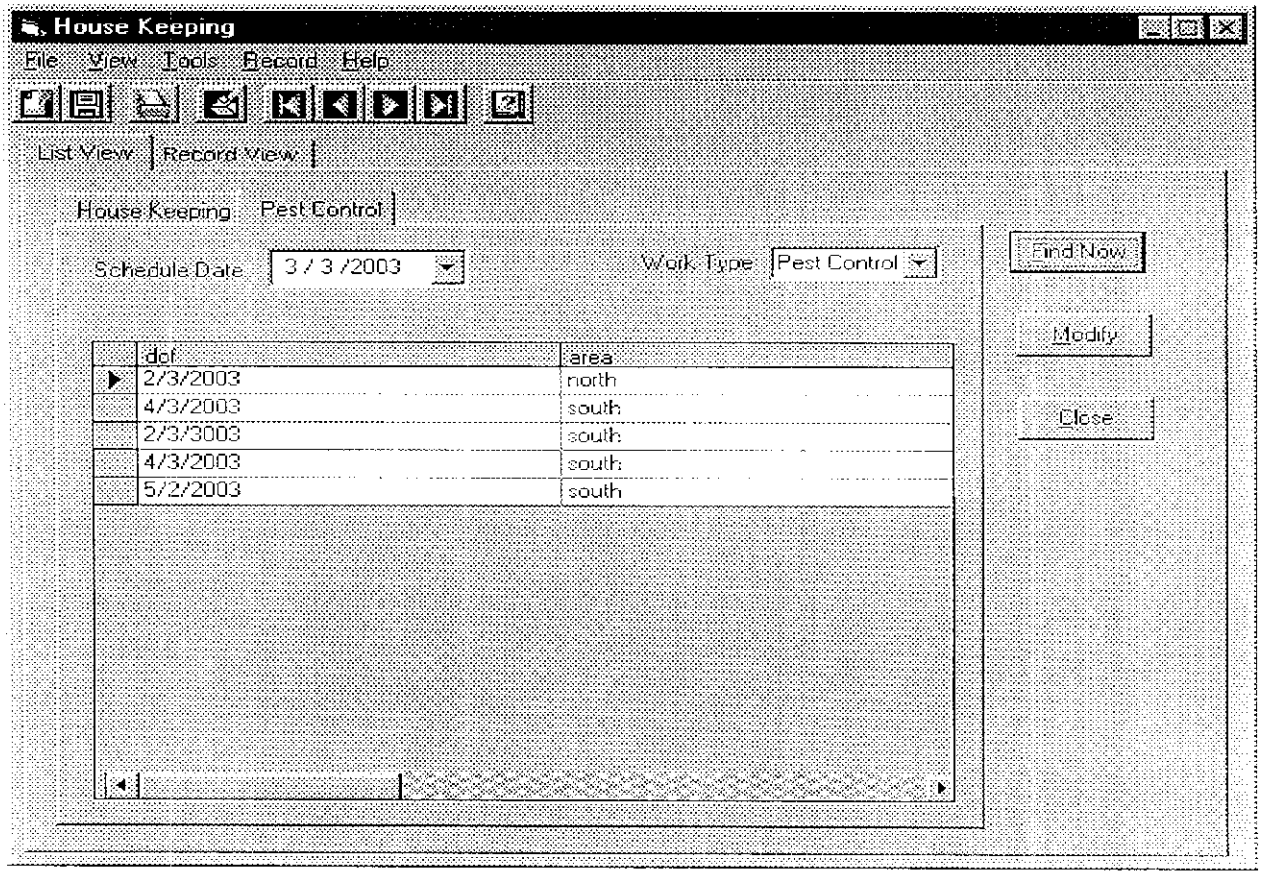



**Fig-3: List view that displays the activities those are to be carried out for the given Schedule date.**

## MATERIAL MANAGEMENT

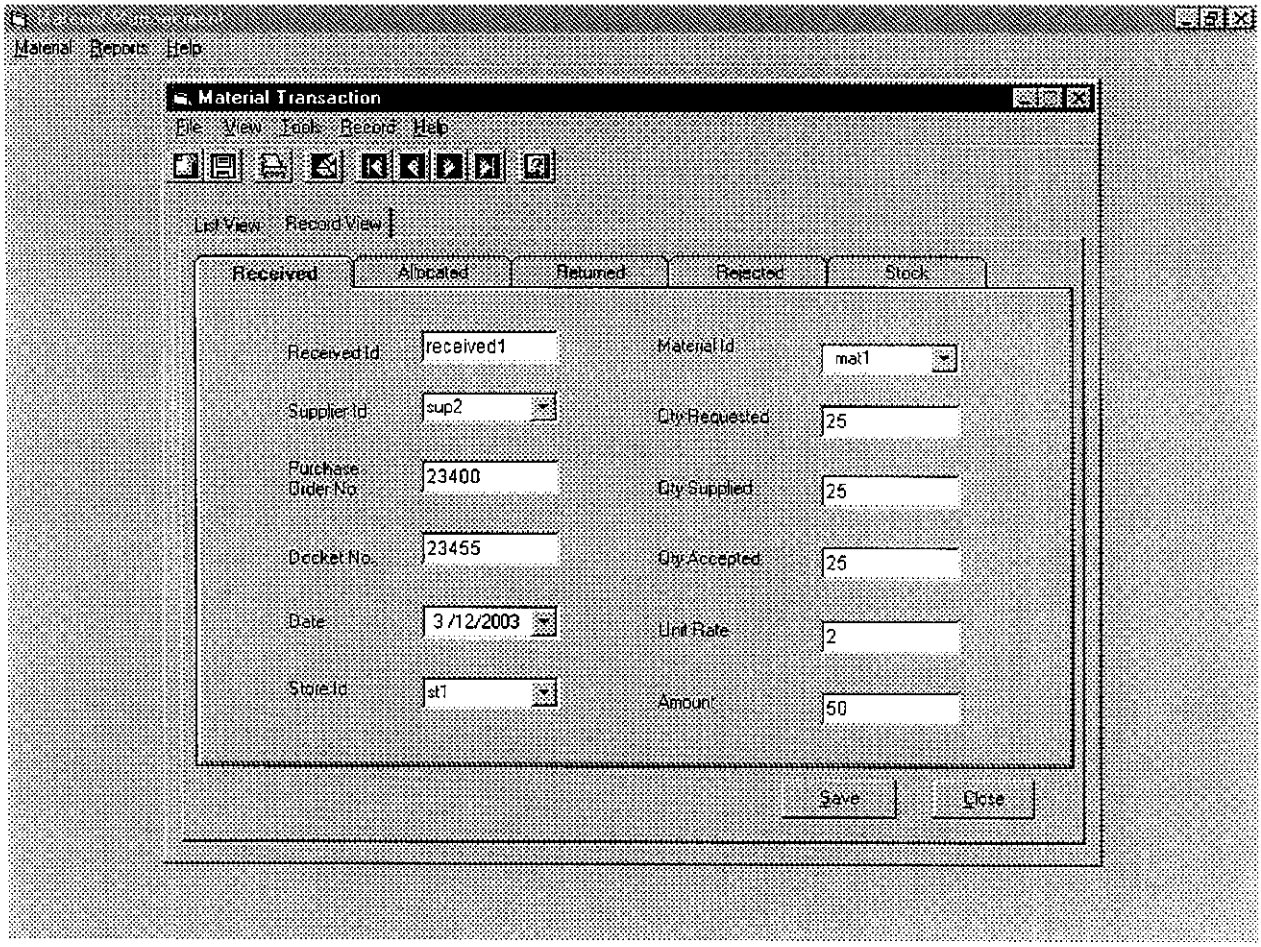



**Fig-4: Form that is used to record the transactions that are made on a day.**

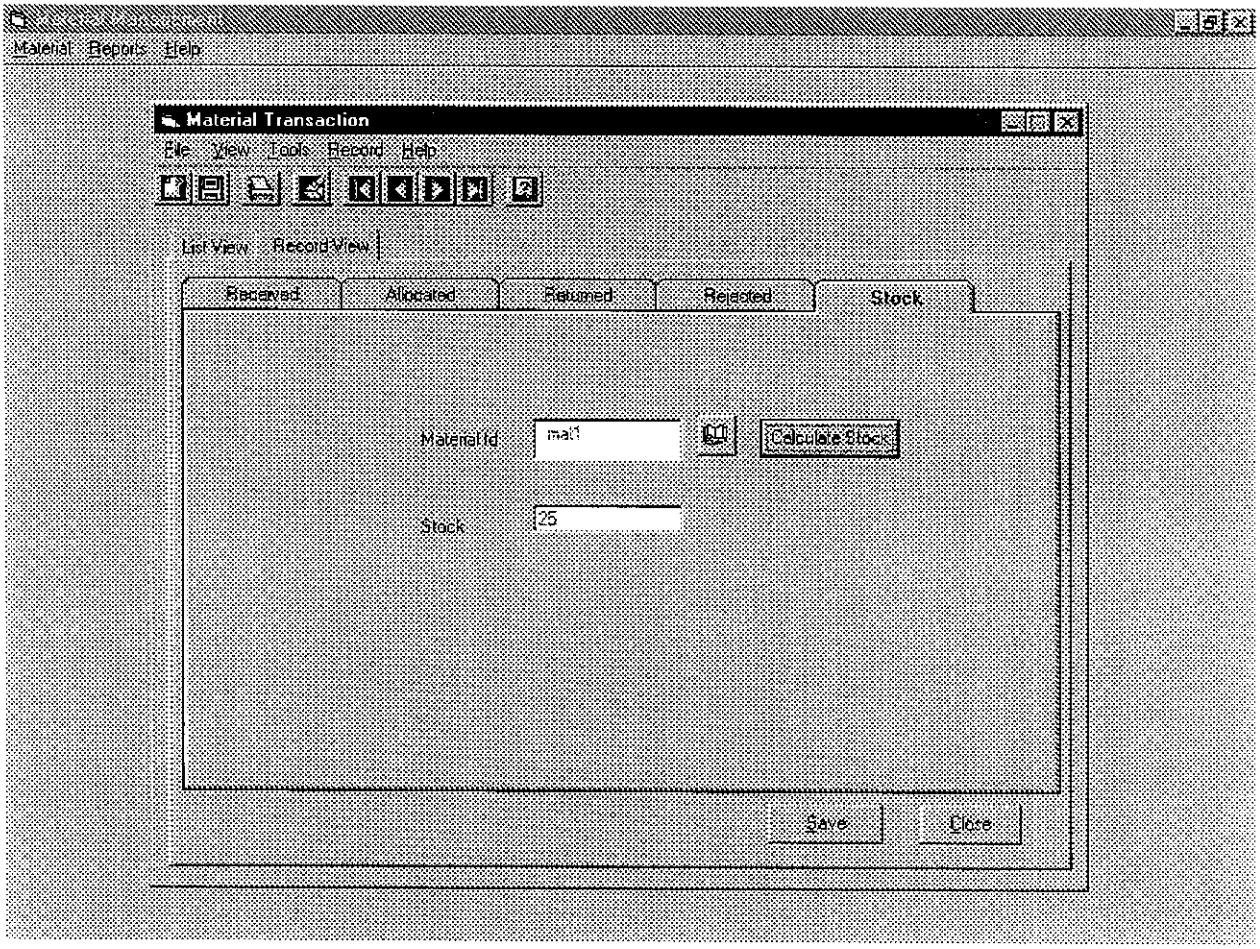



**Fig-5: Stock calculation for a given material.**

## ADMINISTRATION- Parking

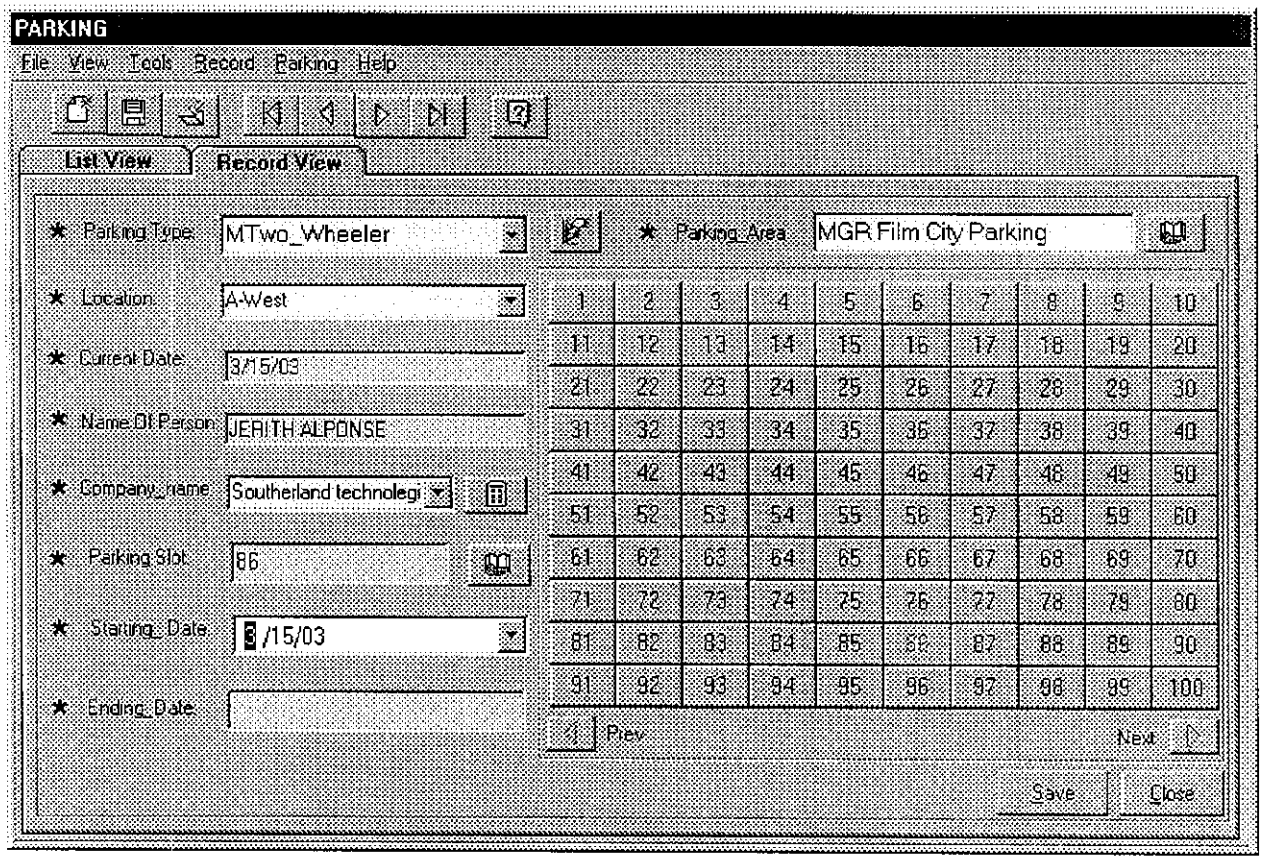



**Fig-6: Allocating a parking slot of type two-wheeler for a person.**

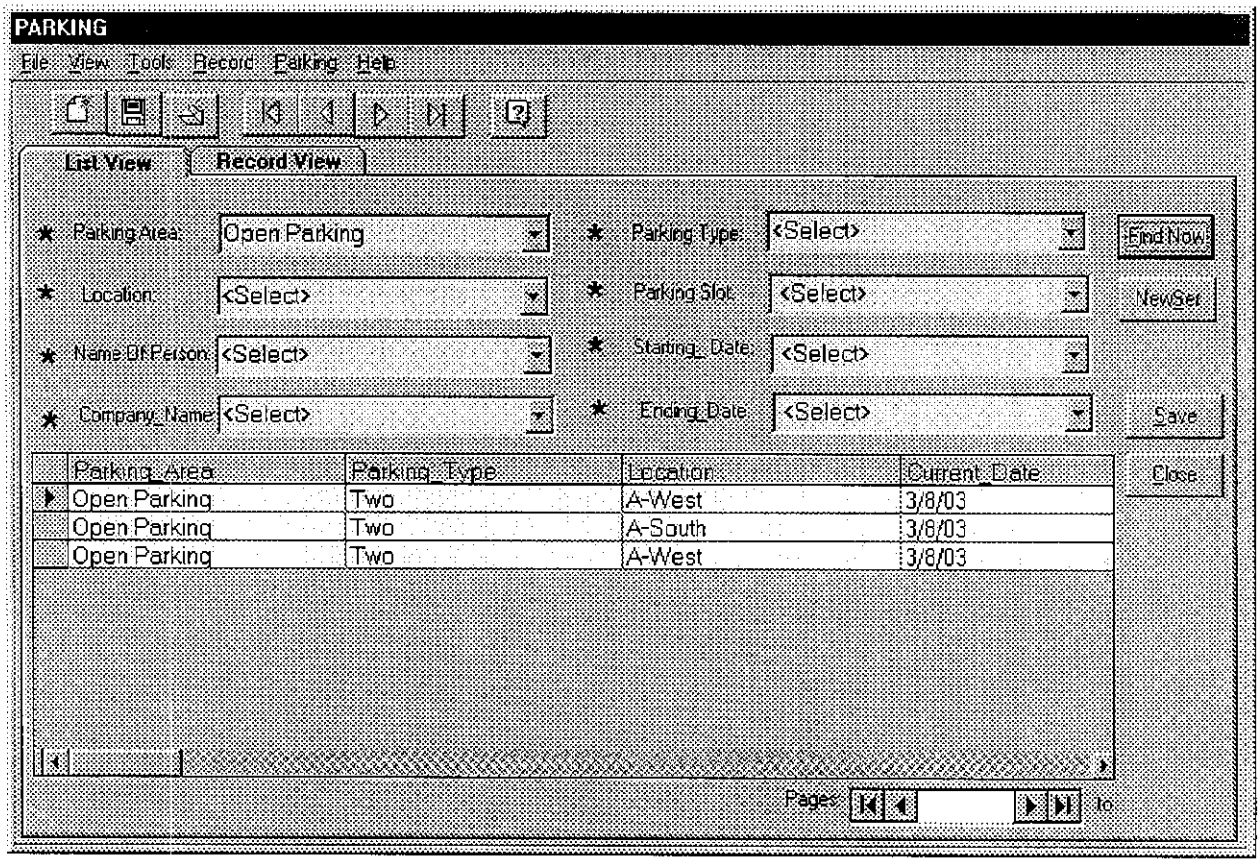



**Fig-7: List view that displays all the parking details that are related to the allocated slots.**

## Booking

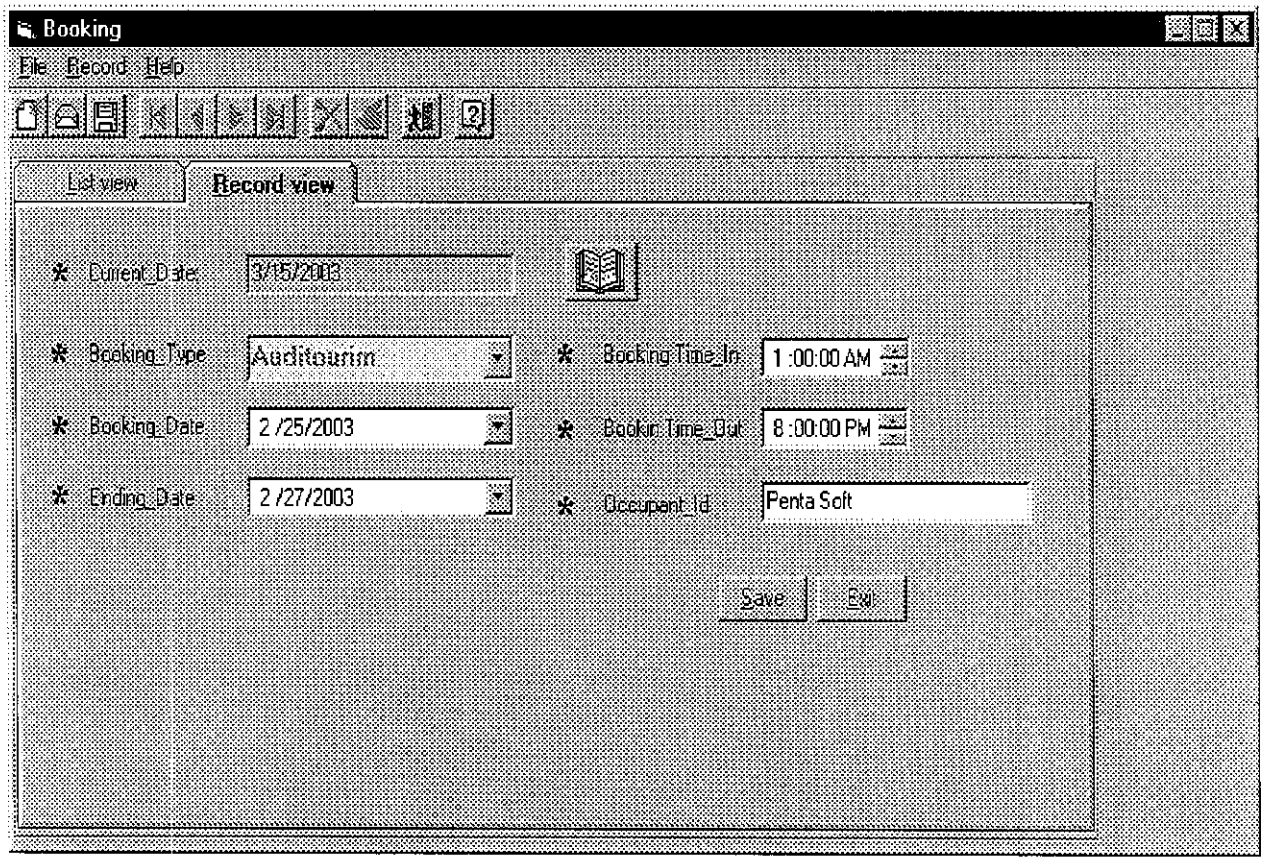



**Fig-8: Form that records the booking of a particular area for a customer or tenant.**

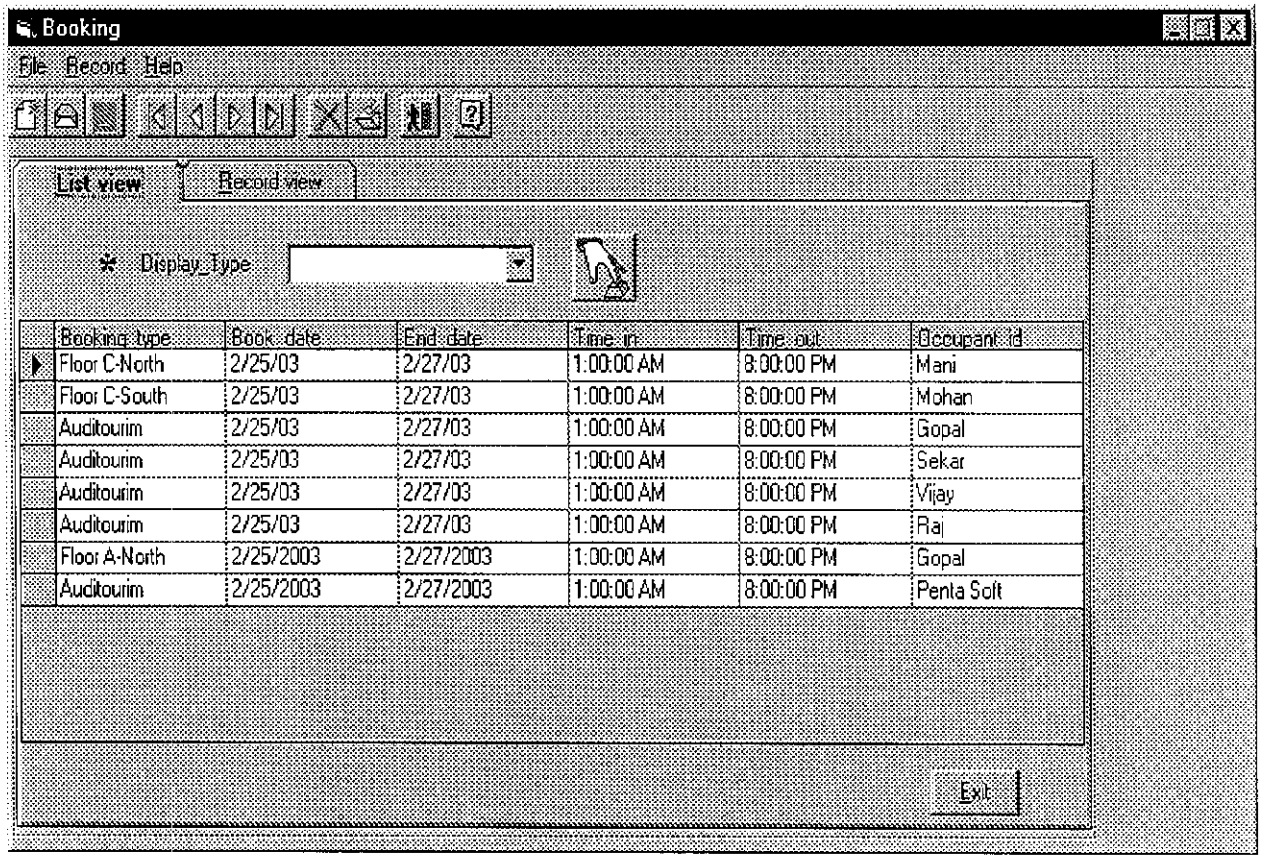



**Fig-9: List view displays the records that are related a particular booking type.**

## HELP DESK

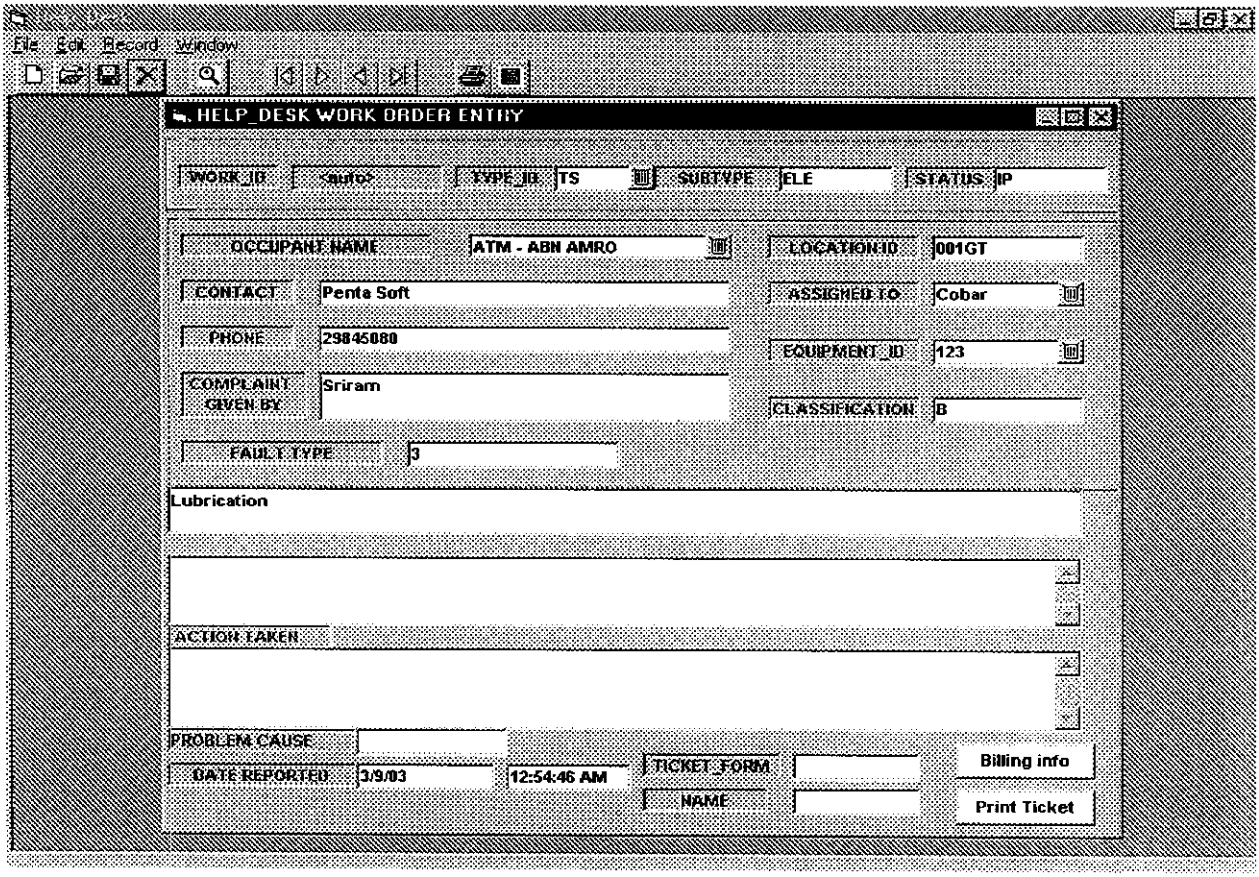



**Fig-10: Generating work order for a call registered by a tenant.**

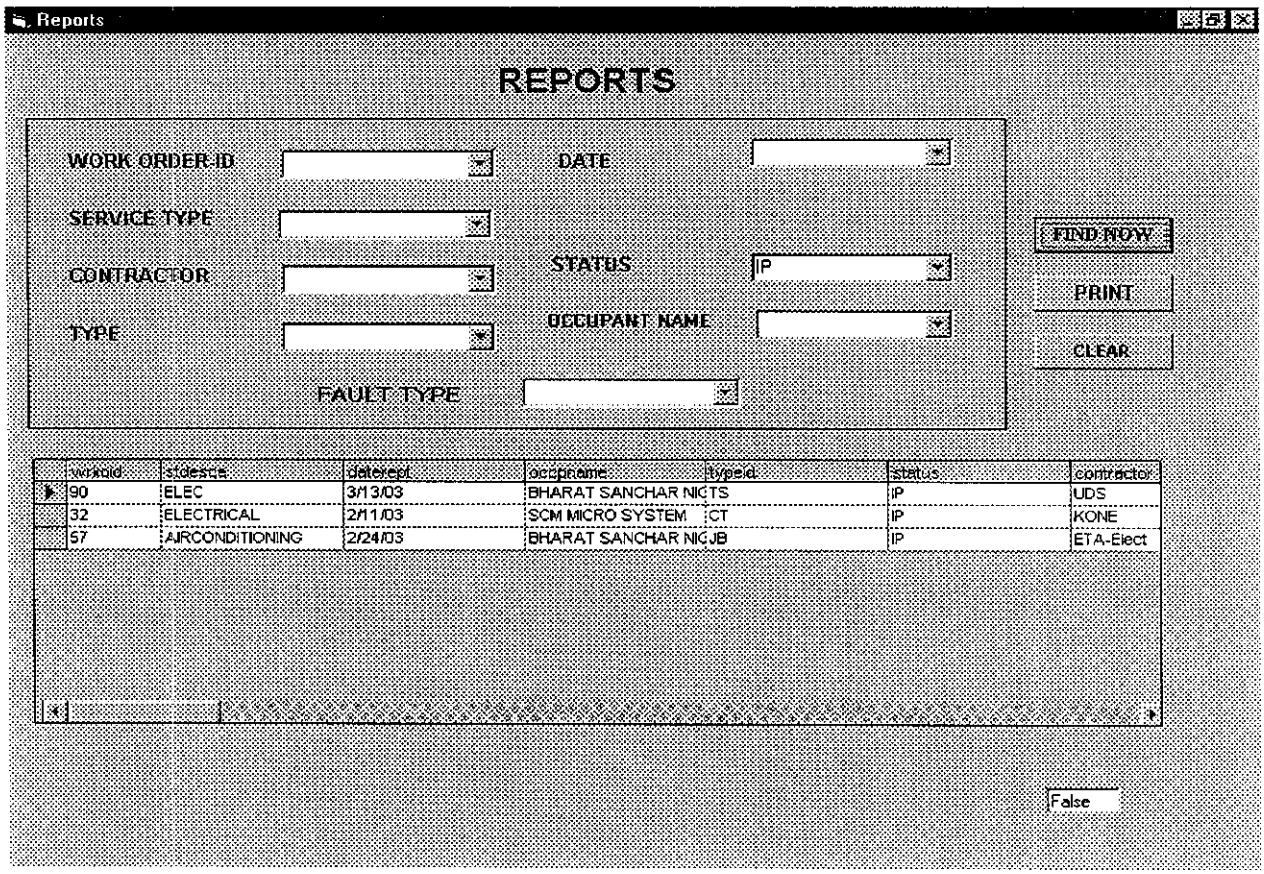



**Fig-11: Generating report for any or all given data that corresponds to call registered.**

# SYSTEM IMPLEMENTATION

# 5. SYSTEM IMPLEMENTATION AND TESTING

## 5.1 SYSTEM IMPLEMENTATION

The system replaces the existing system that is being used by the CBRE staff. Since it replaces existing system it includes a lot of work incase of implementation. The CBRE staff has to follow a parallel or backup conversion of existing system to new system. This is because it should handle a voluminous data. If other conversion is made then the data will be in risk.

In that case the time for conversion will be more and the user has to enter a large number of data into the database before start using the new system.

Implementation process:

- Link each individual module with one another, which makes a whole new system.
- System tested and missing functions identified modified.
- The back end of the system is changed from Access to SQL database.
- System tested and modified.
- Configuring the system after installing into the computer, during which the location of the database will be set.
- The data are entered into the SQL database using this system, which will be used for further transactions.
- If any new computer is to be installed with the Facility Management System the database location has to be configured.
- In case the database location is to be modified in the installed system then the same can be done using the configure option in the Facility Management System.
- If new area is added into the building then it can be added in the system by using the House Keeping function.
- In case of adding new areas for parking vehicles it can be added using the Administration module.
- Help desk plays an important role in interacting with the tenant who registers the call to CBRE. Because of this reason help desk is also used by the tenant or customer, which receives more concentration of the developer.

## 5.2 TESTING

Testing is to be carried out in two stages, first is testing the system that uses Access and second the system that uses SQL. Testing which is going on is only on system that uses access as its backend. In this stage it is planned to conduct the following testing:

### Unit testing

Unit testing is performed to check the individual program unit that are written for each individual controls in the forms. The person involved in this testing is:

- Developer

He checks the code written for each control by giving the sample data to the system. This was done during development period that is after writing code for each control.

### Functional Testing

Function testing is done to check the completion of functions for each individual module. Persons involved in this testing are:

- CBRE System Administrator
- Developer

In this testing only the functions that are included by the developer are checked for its completeness and the system administrator will notice any modification on the function. This testing is done after the design of all the functions of a module.

### Volume Testing

Since this system has to handle a large amount of data volume testing is considered to an important one. The persons those who conduct this testing are:

- CBRE concerned staff
- CBRE System Administrator
- Developer

The responsible staff will be allowed to check the system by entering the large amount of data into the system. The end user will enter the original data into the system. During the session the way of entering data by the end user will be taken into notice, which will be modified in the system.

**Integration Testing**

This testing is to be done to check the interaction between each individual module. The persons involve in this testing are:

- System Administrator
- Developer

Administrator has to run the forms that interacts with other module and must enter data that refers to data that are used by other modules. In many cases one table will be used by more than one module. One such table is work order table. This contains the work order details that are created using help desk, and the same details are used in material transaction.

# SCOPE FOR FUTURE DEVELOPMENT

# 6. SCOPE FOR FUTURE DEVELOPMENT

**Modularisation**

Facility management system is divided into modules. Each module contains more than on functions. All modules share more than one table that is common to all the modules. In Facility management Help desk creates the work order for the call registered by the tenants. This work order details are stored in a table. These details are used in the material transaction, for generating bill and for the transaction of materials between stores and customer, and between stores and supplier.

Modularisation of facility management allows the user to add new modules to the system in future. While adding new module developer can use the existing tables, which reduces the developers job.

**Product**

This system is developed for maintenance of Tidal Park building. The system can be used for maintaining any building that handles more records for maintenance and that needs an efficient method of maintenance.

It is developed in such a way that it can add new areas that are to be maintained and new activities that are to be performed for the maintenance of any building. This system is planned to use by CBRE in all its branches. This makes the system as a product that can be used for any building maintenance and not as software that can be used only for particular buildings.

**Common Tables**

Following list shows the tables that are commonly used by more than one module. These tables can be used while adding new modules to the Facility management system.

**Area:**

| Field Name | Type |
|---|---|
| Area Id | Number |
| Area Name | Text |

**Location:**

| Field Name | Type |
|---|---|
| Location Id | Number |
| Location Name | Text |

**Work order:**

| Field Name | Type |
|---|---|
| Work order Id | Number |
| Generated By | Text |
| Occupant Id | Number |
| Work type | Text |
| Location | Text |

# CONCLUSION

# 7. CONCLUSION

This system developed for CBRE is a versatile one and could be adopted for any type of building. The system is developed based upon the details given by the CBRE staff and the System Administrator. This improves the efficiency of the work done by the CBRE staffs in the field of maintaining the Tidal Park building.

The system is developed as specified by CBRE staff as mentioned in the synopsis. It attains this stage after a several number of modifications given by these staffs.

The system is developed in such a way that adding new functions as modules in future course can enhance it. Processing time will be less if this system is used for the maintenance of the building, which in case if it is performed manually takes more time and the process will also be lengthy.

User interface provided by this system is user friendly, which can even be used by the person, who doesn't have complete computer knowledge. System is still to be tested by the concerned staffs responsible for the individual modules. The system has to undergo the conversion of access database to SQL database and testing its performance.

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# REFERENCES

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3. Gary Cornell, "Visual Basic 5 from the Ground up", Tata McGraw-Hill 1997.

2. Noel Jerk, "Visual Basic 6.0 Complete Reference", Tata McGraw-Hill, 1995.

**Website References**

www.microsoft.com

www.cbre.com

www.msdn.com

# APPENDIX-A

## Glossary of Terms

| | |
|---|---|
| 1. CBRE | - CB Richard Ellis, the Property Maintenance Company |
| 2. O & M Team | - The approved Sub Contractor to carry out the Operation & Maintenance activities. |
| 3. Customer/Occupant | - Occupant - Represents the companies that are working in the Tidal Building |
| 4. Head Asset Services | - Head of CBRE - Indian asset services |
| 5. Area Head | - Head of Operations of each city |
| 6. Management Representative (MR) | - Representative nominated by CBRE management for monitoring and controlling of ISO process. |
| 7. Section Head (SH) | - CBRE's Representative responsible for the activities of the specified department. |
| 8. Chief Security Officer (CSO) | - CBRE's Representative responsible for the security activities of the site. |
| 9. Admin Manager | - CBRE's Representative responsible for the administrative activities. |
| 10. Help Desk (HD) | - CBRE's Representative responsible for receiving / forwarding and documenting customer complaints / break down complaints. |

# APPENDIX-B

## List of Acronyms

| | | |
|---|---|---|
| 1. QMS | - | Quality Management System |
| 2. QSP | - | Quality System Procedure |
| 3. QM | - | Quality Manual |
| 4. CL | - | Check List |
| 5. SC | - | Schedule |
| 6. WI | - | Work Instruction |
| 7. ACMV | - | Air Conditioning Mechanical & Ventilation. |
| 8. DG | - | Diesel Generator |
| 9. FPS | - | Fire Protection System |
| 10. IBMS | - | Integrated Building Management System |
| 11. PPM | - | Planned Preventive Maintenance |
| 12. MRM | - | Management Review Meeting |
| 13. RFQ | - | Request for Quote |
| 14. NCR | - | Non-Conformance Report |