PLANNING AND SCHEDULING OF A PORT AND A MULTISTORIED BUILDING

A PROJECT REPORT

Submitted by

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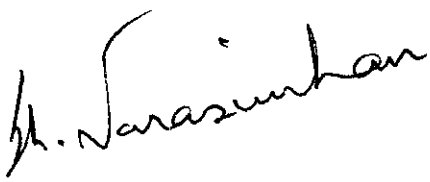
BONAFIDE CERTIFICATE

Certified that this project titled " **PLANNING AND SCHEDULING OF A PORT AND A MULTISTORIED BUILDING** " is the bonafide work of " **S.NATHIYA, K.PARVATHAVARTHINI, P.SARANYA & S.SUJITHA**" who carried out the project work under our supervision.



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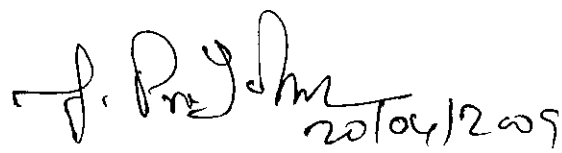

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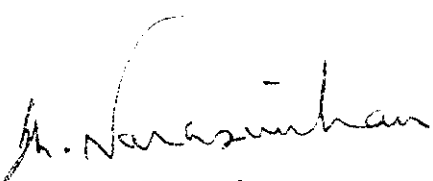

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ABSTRACT

The main objective of this project is to gain knowledge on the various phases in the planning and construction of a structure. A port and a multistoried building have been selected for this project and complete planning and scheduling has been done using software. Construction planning and scheduling for the port has been prepared using the software 'MS-PROJECT'. The software 'PRIMAVERA' has been used in the preparation of construction schedule of the apartment building.

The study on various components involved in the port has been carryout out by collecting data from the port authorities.The port has seven berths, a well dredged turning basin and other terminal facilities.

The multistoried building selected for this project is an apartment complex with two blocks with ground +4 floors each. Each floor houses four flats. Staircase and lift facilities also provided.

The various phases of planning and scheduling such as defining the activities involved, estimation of activity durations, activity linking, assigning resources, critical path identification, cost estimation and schedule control are done using software.

The reports in the form of tables and charts with estimated duration for completion of the project, resources required and projected cost of the project are also generated and presented in this project.

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1.INTRODUCTION

1.1 GENERAL

Planning and scheduling of a construction project involves the following

Planning:

1. Activity definition
2. Activity sequencing
3. Activity duration estimating

Resource management

Cost estimation

Scheduling:

1. Establishing relationship between activities
2. Schedule development
3. Schedule control and updating status

1.1.1 PLANNING:

1. Activity Definition:

Activity definition involves identifying and documenting the specific activities that must be performed to construct the structure. Implicit in this process is the need to define the activities such that the project objectives will be met.

Historical information such as what activities were required on previous similar projects should be considered in defining project activities. Constraints that will limit the activities are also to be identified.

2. Activity Sequencing:

Activity sequencing involves identifying and documenting interactivity dependencies. Activities must be sequenced in the right order to achieve proper scheduling. Dependencies may be mandatory dependencies or discretionary dependencies.

Mandatory dependencies are those which are inherent in the nature of the work being done. They often involve physical limitations. For example erecting the superstructure after laying the foundation.

Discretionary dependencies are those which are defined by project management team. They must be used with care since they may limit later the scheduling options. They are defined on the basis of best previous practices and some unusual aspect of the project where a specific sequence is desired even though there are other acceptable sequences.

3. Activity Duration Estimating:

Activity duration estimating involves assessing the number of work periods likely to be needed to complete each identified activity. Estimating the number of work periods required to complete an activity will often require consideration of elapsed time as well.

For example if concrete curing will require four days of elapsed time, it may require from two or four work periods based on which day of the week it begins on and whether or not weekend days are treated as work periods.

1.1.2 RESOURCE MANAGEMNT:

Resource management involves identifying the resource requirements and resource capabilities. The duration of the activities will significantly influenced by the number of resources assigned to them. The capabilities of the men, materials and machines also influence the activity.

The number of resources required may be calculated using information from previous project.

Once the resources are identified they have to be assigned to the required activities. Over allocated resources and idle resources are then traced and they are rectified by resource leveling.

1.1.3 COST ESTIMATION:

Project cost is estimated based on resource usage, additional overheads, variable resource rates and over time rate.

1.1.4 SCHEDULING:

1. Establishing relationship between activities:

Based on the dependencies of the activities on one and another, four types of relationships may be assigned to the activities. They are as follows;

- Finish- to- start: Preceding activity must finish before the next can start.
- Finish- to- finish: Preceding activity must finish before the next can finish.
- Start – to – start: Preceding activity must start before the next can start.
- Start – to – finish: Preceding activity must start before the next can finish.

Finish – to – start is the most commonly used relationship. Start- to – finish relationships are rarely used. Start – to – start and finish – to – finish can produce unexpected results.

2.Schedule development:

Schedule development means determining start and finish dates for projects activities. If the start and finish dates are not realistic, the project is unlikely to be finished as scheduled. The schedule development process must often be iterated prior to determination of project schedule.

Milestone events need to be part of the activity sequencing to assure that the requirements for meeting the milestones are met. Imposed dates and certain milestones may be specified by the client. Leads and lags may be used for certain dependencies in order to accurately define the relationship n scheduling.

3.Schedule control and updating status:

Schedule control and updating the status involves tracking the progress regularly and comparing the plan with the actual performance. The variances are then analyzed and corrective changes may be made. Schedule control also deals with determining that the schedule has changed and managing the actual changes as and when they occur. Performance reports may be used for analyzing and updating the progress.

1.1.5 MS Project

Actual Usage	A measure of the resource expended in completing or partially completing a task.
ALAP	Refers to a task that should be started 'As Late As Possible', using all the free-float time available.
ASAP	Used to indicate a task that should be started 'As Soon As Possible', taking into account the start date of the project and its predecessor tasks.
Baseline	The original project plan, including the time schedule and resource and cost allocations. The baseline is used for comparing projected values to actuals, and facilitates the tracking and analysing of a project's progress.
Cost Variance	A project tracking function recording the difference between the budgeted cost of the work performed and the actual cost. Values below the baseline show an overspend and positive values denote cost savings.
Critical Path	The sequence of tasks or activities whose schedules and durations directly affect the date of overall project completion.
Earned Value	This is a measure of a project's performance, and is calculated by multiplying a task's planned cost by the percentage of work completed.
Float (slack)	The amount of time by which a non-critical task can be delayed before it affects another task's schedule.
Gantt chart	A graphical representation of a project schedule showing each task as a bar, the length of which is proportional to its duration. Many project management packages use a spreadsheet section to the left of the Gantt chart to display additional information.
Hammock Task	A task whose duration is calculated based on the time span between its predecessor and

	successor activities.
Histogram	A bar chart that shows resource workloads over a time period.
Lag	The amount of time between the finish of a predecessor task and the start of a successor task.
Lead	The amount of time that a task is permitted to start before its predecessor is finished.
Loading	A measurement of resource usage on a task per unit of time. Different methods of loading may be used depending on what's available in your project management application and what's applicable for your particular project.
Loading(back)	A loading pattern that allocates resource usage as late in the task as possible.
Loading (contour)	The contour-loading pattern assesses which resources are left over after allocation to the critical tasks and spreads these resources among the remainder.
Loading(fixed)	When using fixed-loading algorithms, you specify the actual amount of resource allocated to the encompassing tasks.
Loading(front)	Front loading systems will attempt to allocate resources as early in the task as possible.
Loading(uniform)	This loading pattern allocates the resource usage on a by day basis in a task. This will usually be done without causing any one task to be over committed.
Milestone	A project event that represents a checkpoint, a major accomplishment or a measurable goal.
Negative float	Refers to an unscheduled delay before an actual task start time that must be recovered if the project is not to be delayed.
OBS codes	Organisational Breakdown Structure codes are used to identify tasks by resource groups in a hierarchical format. OBS codes are often used to reflect departmental structure in a company or code of accounts, and can also be used for filtering tasks.

Network Diagram	Project Evaluation and Resource Tracking charts, also called network diagrams. Network Diagrams are a graphical depiction of task dependencies, and resemble flow charts. Dependencies are shown by connecting lines or arrows indicating the work flow.
Predecessor	In dependency relationships, the predecessor is the task that must be started or completed first.
Project Management	Best defined as a body of knowledge, a set of principles, or techniques dealing with the planning and control of projects.
Resource	Any person, group of people, item or equipment, service or material used in accomplishing a project task.
Resource Levelling	The process of resolving resource conflicts. Most project management programs offer an automated resource levelling routine that delays tasks until the resources assigned to them are available.
Resource Driven	Task durations determined by the program and based on the number of an allocation of resources, rather than the time available. Both individual tasks and entire projects can be resource-driven.
Sub-project	A group of activities which are treated as a single task in a master project schedule. Subprojects are a way of working with multiple projects that keep all the data in one file rather than in independent files.
Successor	In a dependency relationship between two tasks, the successor is the task that must await the start or completion of the other.
WBS codes	Work Breakdown Structure codes are used to identify tasks in a hierarchy. Many project management applications associate these codes with an outline structure. WBS codes can be used to filter the project schedule for tracking and reporting purposes.

1.2 PRIMAVERA

- Primavera project planner is the flagship product of primavera systems, Inc. the leader in the management software since 1982
- Primavera project planner is abbreviated P3
- P3 is specialized in managing all types of projects :small, medium and large
- Big projects through the world were planned and controlled using p3
- P3 is used in almost all countries of the world
- Mainly there are two stages in project management to manage any project:-
    - Planning stage
    - Monitoring stage
- In planning stage, which takes place before the practical start of the project ,the management team will plan for the following factors:
    - Time
    - Resources
    - Cost
- To mention few things takes place in planning stage:
    - Calculating activity duration based on work demanded, productivity, and efficiency of the different resources
    - Understanding the logic sequence of the project
    - Assigning resources and costs to activity, hence, view the Resource/cost histograms
    - Generating a procurement plan
    - Anticipating problems may take place in all parts of the project
- Planning team will use:
    - Previous management experiences
    - Previous practical experiences of similar projects
    - Historical data collected actually from the field

- The plan generated should be practical and doable, and not ideal, and impossible to be accomplished.

- In the monitoring stage, the management team will:
  - Specify the type of data to be collected from the field
  - Decide on which forms should be used in collecting data
  - Collect actual data from the field in daily basis
  - The data collected should cover the three main areas planned for namely: Time, Resources and cost.
- P3 has the sufficient functions to help the user plan for the time, resources and cost and then later monitor them
- P3 has enormous pre- made reports to aid the user producing all the necessary information about the project in either phase of the project
- Also,p3 has the ability to customize layouts with tables and graphics (controlling colors, fonts, etc…)and produce very handsome and colorful reports

1.2.1 METHOD OF WORKING

- P3 is using Critical Path Method (CPM) in calculating the dates and floats of activities.
- P3 is using precedence diagramming method (PDM) in presenting the network.
- P3 will calculate the schedule reference to the data date(DD), which is defined as time now:
- If you are in the planning phase DD is the start date of the project.
- If you are in monitoring phase, it will be the date of the day you will run the schedule command.

1.2.2 IMPORTANCE OF CLASSIFICATION

- Activities are the main components of a project.
- Mid-sized projects may reach 1000-4000 activities.
- Dealing with such big number of activities needs from the user to classify the activities to achieve all/any of the following:
- Organize and group the activities according to common code which will lead to produce good looking layouts.
- Produce complex reports fast and accurate.
- Answer urgent questions (e.g. in meetings) using simple steps.
- Classification can be done using:
- Activity codes(code or ID)
- WBS (work break down structures)

2. LITERATURE REVIEW

2.1 PORT

2.1.1 HARBOUR AND PORT:

A harbour is a partly enclosed protected water area to provide safe accommodation for vessels for transfer of cargo, refueling or repair. A port is a harbour where marine terminal facilities are provided. The facilities consists of piers of wharves at which ships berth while loading or unloading cargo, transit sheds and other storage areas where ships may discharge incoming cargo and warehouses where goods may be stored for longer periods while awaiting distribution or sailing.

REQUIREMENTS OF PORT:

- It should have easy connections with rail and highway so that commodities may be transported to and from the port easily.
- It should be situated at a place where the hinterland is fertile and the passage to the open sea must have sufficient depth and width and must be suitably marked to aid navigation.
- Ships reaching the port must be able to anchor while waiting for a berth to discharge or take on cargo or fuel.
- The port must possess adequate facilities for handling and storing the commodities passing through the port.
- It must have facilities for serving the ships.
- Breakwaters must be provided to protect against destructive wave action
- The bottom should furnish secure anchorage to hold ships against the force of high winds.
- The port entrance must be wide enough to permit the ready passage of ships and narrow to restrict the transmission of excess wave energy in times of storm.

LOCATION OF A PORT:

The main function of a port is to provide a sheltered area where vessels can moor. An easy accessibility of a port implies a wide and straight approach, the direction of which coincides with the direction of the currents and highest waves. Wide entrance is desirable for manoeuvring. Optional layout of a port navigation does not exist in reality. It is because of the fact that a port of an open coast with a wide entrance, facing the highest waves cannot entirely be a sheltered area. A strong wave action in the port not only hinders mooring and cargo handling but it also enhances the design criteria for the port structure. The other factors affecting the port site are cost of construction and maintenance for marine structures, the required initial dredging and the recurrent dredging for the maintenance of design depths.

PLANNING OF A PORT:

The important considerations which should precede the technical studies for planning are need for the port, economic justification, prospective volume of seaborne commerce and the availability of inland communications by land and water.

After the above studies estimation is made regarding the general location of the port, principal use of the port, type and tonnage of traffic to be handled. For preparation of a complete site investigation programme, it is necessary to make preliminary studies and layouts of the port. The investigation should contain site information from hydrographic and topographic surveys, subsoil investigation at location of breakwaters, wharves, piers, bulkheads and other marine structures and the general direction and velocity of current in the area.

The ultimate design of a port depends on various factors whose importance in turn depends on the prevailing conditions in the area. It is

essential to obtain good knowledge of these conditions by means of appropriate field studies while in addition their effect on the port must be studied. Because of the complexity of natural phenomena, the use of a small scale model is often indispensable.

2.1.2 DEFINITIONS:

Turning Basin:

It is a water area inside a port or an enlargement of a channel to permit the turning of a ship. Where space is available the area should have a radius of atleast twice the length of the ship to permit free turning or turning with aid of tugs, if wind and water conditions require. Where space is limited the ship may be turned by warping around the end of a pier, either with or without the use of its lines. In this case the turning basin may be much smaller and more of triangular or rectangular shape.

Breakwater:

This is a protective barrier constructed to form an artificial harbour with a water area so protected from the effect of sea waves as to provide safe accommodation for shipping.

Dock:

This is a marine structure for mooring or tying up of vessels, loading and unloading cargo or embarking and disembarking passengers.

Quay wall or Bulkhead:

These are protection walls of quay backed up by ground. It holds or supports ground in back of it.

Wharves:

These are platforms or landing places for ships to come close enough to the shore for embarkation and disembarkation. They are built out into or onto the water. When along and parallel to the shore, they are called quays.

Jetty or Pier:

This is dock that projects into ship's basin at right angles or oblique from shore. When it is built in combination with a breakwater then it is known as breakwater pier. The main function of a jetty is the preservation of a channel against the encroachment of littoral drift river sediment. They are generally built in pairs. The ships may use a pier on both sides whereas wharves are used only on one side.

Mole:

This is a fill, usually rock, extending from out shore. The side slopes of this are provided with riprap or armour rock to protect it from erosion. The upper surface of mole is made wide enough to provide roadway, sidewalk, rail, road tracks, utilities, pipelines and conveying facilities to serve the pier.

Trestles:

They are lighter piers, designed for vertical loads as the principal forces. It does not have to withstand a ship's docking and mooring forces. Depending upon the approach at the centre or at the end the piers are called as T head pier or I shaped pier.

Dolphins:

They are marine structures for mooring vessels. They are commonly used in combination with piers and wharves to shorten the length of these structures. They are a principal part of the fixed mooring berth type of installation used extensively in bulk cargo handling. They are of two types

known as breasting and mooring. Dolphins are used for tying up ships and for transferring cargo between ships moored along both sides of the dolphins.

Breasting Dolphins:

These are larger marine structures for mooring vessels. They are designed to take impact of a ship when docking and to protect the dolphin and ship from damage. They are provided with mooring posts known as bollards to take springing lines for moving a ship along the dock or holding it against the current.

Mooring Dolphins:

They are provided to hold a ship against the road side wind blowing in a direction away from the dock. They are away from the face of the dock. Hence they are not designed for the impact of the ship. They are provided with mooring posts and with capstans when heavy lines are to be handled.

Mooring for Ships:

They comprised of ground tackle placed in fixed position for attaching a ship's line. Each unit of ground tackle consists of one or more anchors with chain, sinker and buoy to which the ship's line is attached. These moorings are usually located so as to take the bow and stern lines and if the ship is large one or more breasting lines.

Fixed Mooring Berth:

This is a marine structure consisting of dolphins for tying up a ship and a platform for supporting the cargo handling equipment. The platform is usually set back 2 to 3 m from the face of the dolphins so that the ship will not come in contact with it.

Dock Fenders:

They are horizontal wood members or a number of vertical wood members or rubbing strips fastened to the deck or face of the dock. They prevent a ship or dock from being damaged during mooring.

Catwalks:

They are used to provide access to and between dolphins. They serve as a convenient means of running out ship's lines to their moorings.

Transit sheds:

These are stores for a short period of time for cargo awaiting loading or distribution after being unloaded from ships. They are located immediately in back of the apron on a pier or wharf.

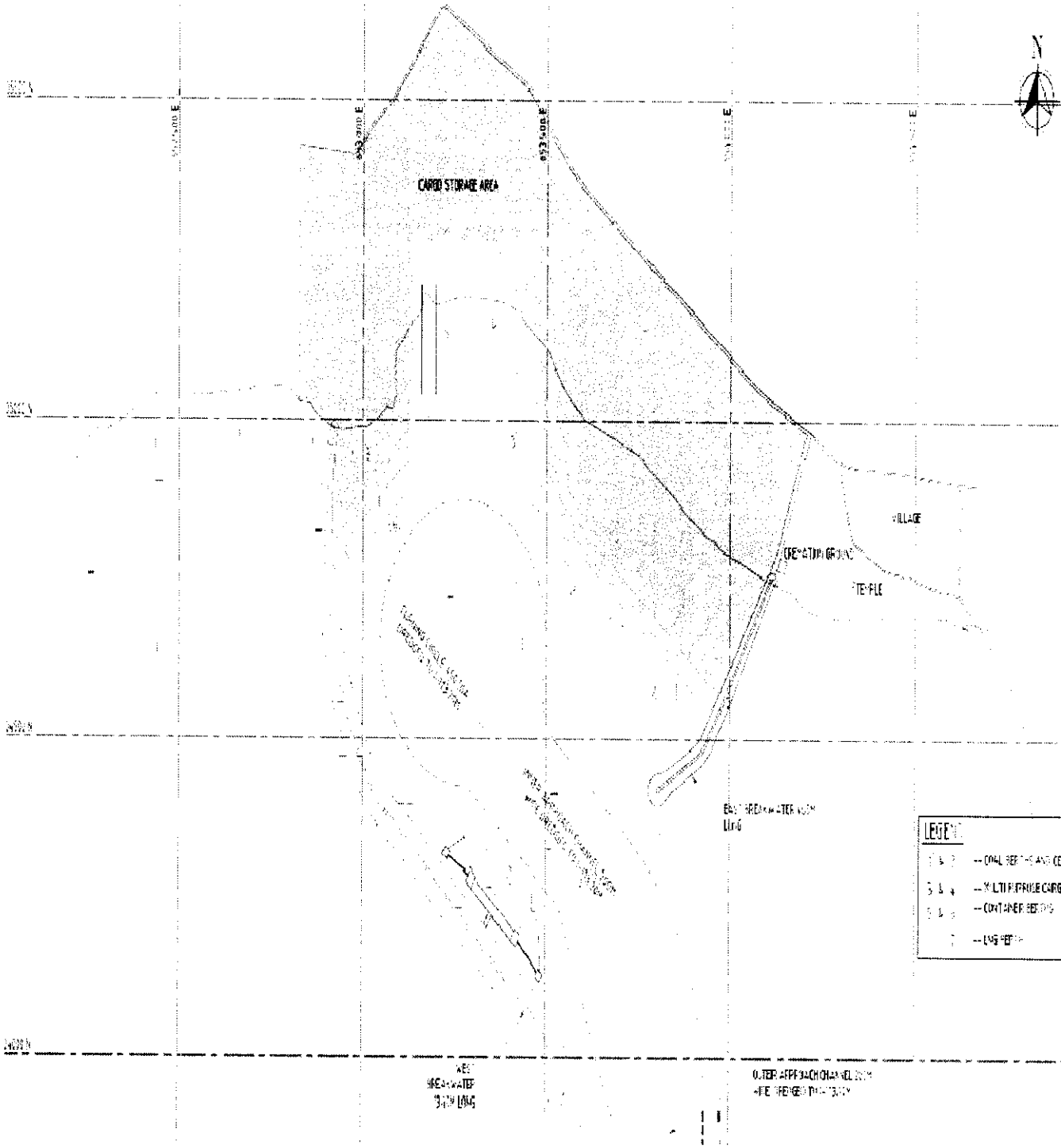
Warehouses:

They are stores where goods may be stored for danger periods while awaiting sailing. They are generally located inland and not on the pier structure.

Terminal Building:

It is a building to house port administration, personnel and custom officials. It should be located in a prominent and convenient location with respect to docks.

2.2 LAYOUT OF PORT



2.3 LAYOUT EXPLANATION

The figure under 2.2 shows the layout of the proposed port. It consists of seven berths. Two for coal and cement, two for other cargo, two container berths and one long berth for special requirements. The vessels enter the port through the outer approach channel and move on to the inner approach channel. The turning basin of 450m diameter is provided for easy turning of large ships. The approach channel and turning basin are approximately dredged to 13.2m.

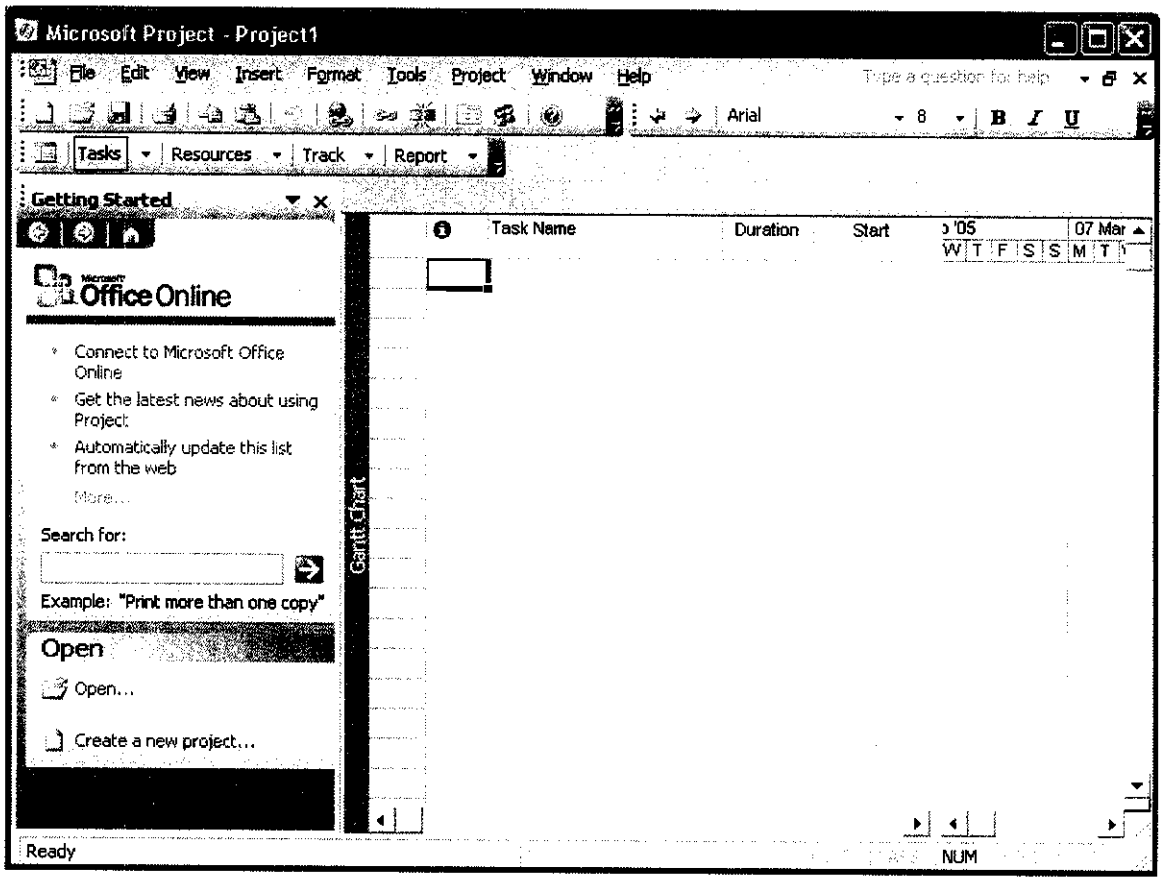
Breakwaters are constructed on the eastern and the western side. The length of the eastern breakwater is 465m and that of the western breakwater is 1340m. A warehouse for cargo storage is also provided. Other port terminal facilities include administration building, control tower and a substation. The required navigational aids are assembled and commissioned. The various offshore structures are well connected by roads. A compound wall circumferences the entire port. Water supply and electrical installations are also provided.

2.4 MS PROJECT PROCEDURE

Starting MS Project

Double-click on the MS Project icon or Click the Start button, select Programs, select the Project icon.

MS Project - The Screen



2.4.1 Views and Tables

A view is the format of the way that project data is displayed on the screen and there are a considerable number of different permutations that can be used.

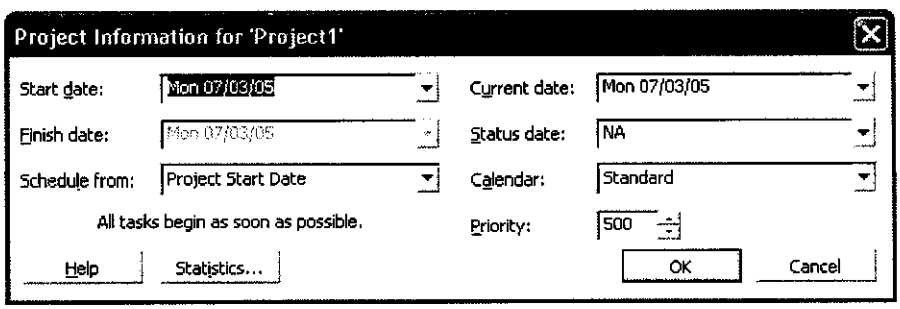
The table below describes some of the main views in Project.

Calendar:	Shows the view in the form of a calendar.
Gantt Chart:	A diagrammatic view of the Tasks and their time scale. This chart can also show the relationship between Tasks and the Critical Path. It usually shows the task entry form alongside the Gantt chart.
Network Diagram Chart:	Network Diagram is an acronym for Programme Evaluation Review Technique. This view represents each Task as a box with relevant information within it. The layout of the boxes on the chart and the lines that link the boxes represent the structure of the project.
Task Usage:	The Task Usage view displays project tasks with their assigned resources grouped underneath them.
Tracking Gantt:	The Tracking Gantt view displays two task bars, one on top of the other, for each task. The lower bar shows baseline start and finish dates, and the upper bar shows scheduled start and finish dates (or if the task has already started, meaning that the percentage complete is greater than zero, the upper bar shows the actual start and finish dates).
Resource Graph:	A graphical representation of a single resource and its utilisation.
Resource Sheet:	A list of all the resources for the project.
Resource Usage:	This is a view that shows the use in hours per day for each resource.
More Views:	Allows the showing of combination views as well as details of a single Task

Table:(Entry):	Changes the form alongside the Gantt chart.
Reports:	Takes you into Report Wizard.
Toolbars:	Allows you to change the Toolbar display.
View Bar:	Activates the View bar, located vertically on the left of the screen.
Zoom:	Changes the amount of information you can see on screen, from days to years.

Starting a New Project

The Project Info dialog box, illustrated below, records background information and allows you to enter scheduling information. The dialog box allows you to specify either the project start or finish date. If you enter a start date, the finish date will be automatically calculated. If you enter a finish date, the start date will be calculated. Note, however, that if you choose to enter a finish date, all tasks will be considered critical because they will all be scheduled as late as possible. If you do not enter a project start or finish date, Microsoft Project will automatically use the current date as the start date. The Project Info dialog box also allows you to specify the project calendar, as shown below.



The Project Info Dialog Box

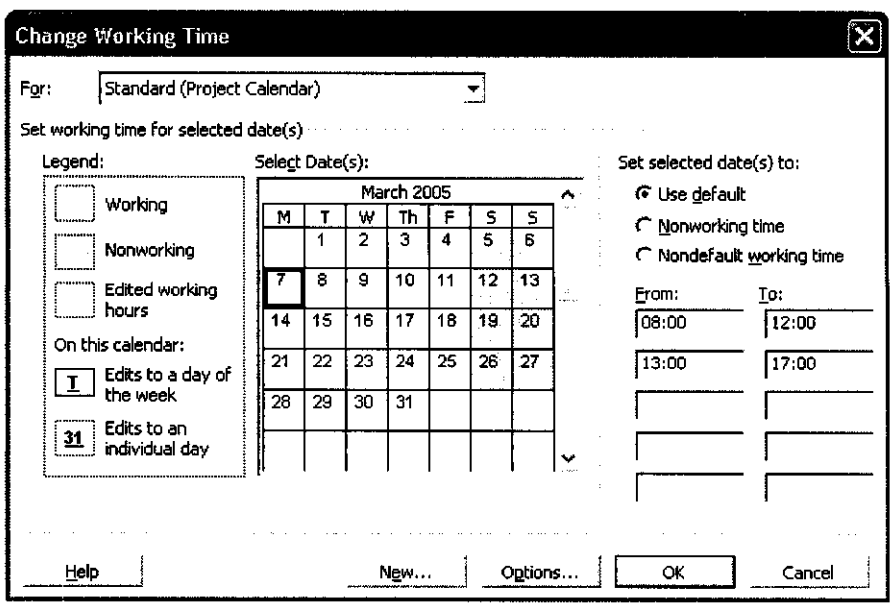
To start a new project:

- Choose New from the Standard Toolbar.
- The Project Information dialog box allows the selection of the appropriate information.
- To view project statistics, choose Statistics.
- Once you have viewed the necessary information, choose Close.

2.4.2 The Calendar

The Default Working Calendar is used by MS Project to calculate all Timescales and Resource costs. It defaults to a working day of 8 hours with the working hours 0800 to 1200 and 1300 to 1700.

You can create your own calendar with your own particular times. If this is not a standard 8-hour day you must remember to tell MS Project what the standard day is. Each resource you add will be based on the calendar you select when you start your project.

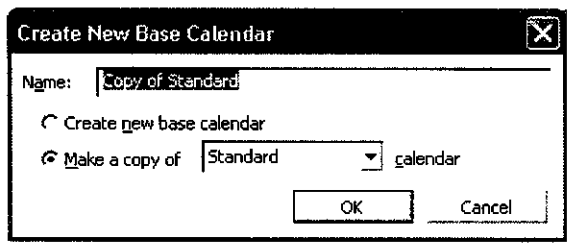


The Change Working Time Dialog Box

Resource calendars deal specifically with resources—that is, working hours, working days, and vacations on an individual basis. Resource calendars are created automatically when a resource is added to the pool. Users do not create resource calendars. It is up to the user to attach a resource to a specific base calendar.

Creating a New Base Calendar

When creating a new calendar, you have the option of creating a brand new calendar or of creating one based on an existing calendar, as indicated below



Creating a New Base Calendar

Create a new Calendar

- From the Tools menu, choose Change Working Time.
- Choose **New**.
- In the Name text box, type the new calendar's name.
- Select either the Create new base calendar or Make copy of calendar option button.
- Choose OK.
- If required, select the desired month by clicking the up/down arrow on the vertical scroll bar of the calendar.

- In the calendar, either select specific dates for which you want to make a change or select all days of the week by selecting the column headings.
- Specify the changes to be applied to the selected days, i.e., working, nonworking, default, or hours.
- Choose OK

2.4.3 Entering Tasks:

This is the main activity in setting up a new project. The tasks which have been identified at the Design Stage must be entered.

The system will hold task information in a task database, which we cannot access directly but is used by the system whenever we view task data. This is one of two databases the system uses the other being the resource database.

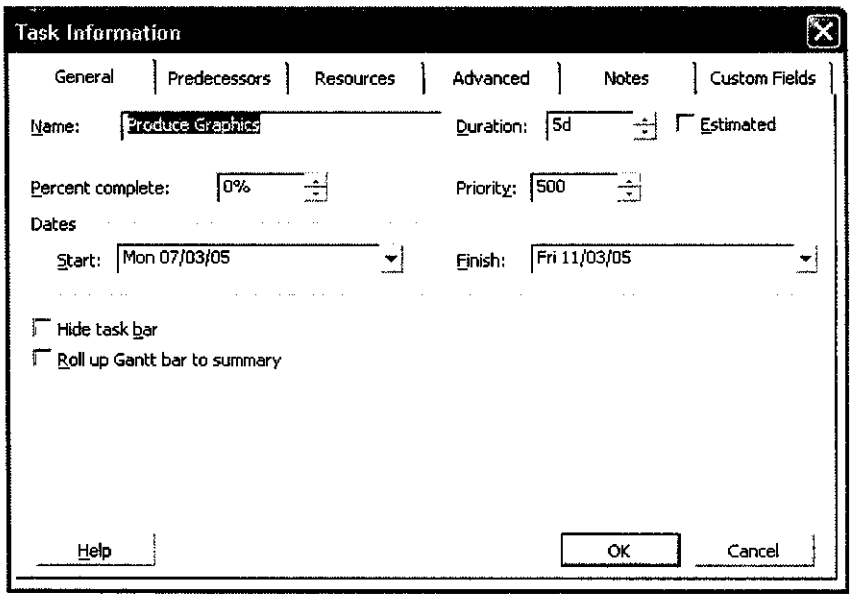
It is important to understand that the system checks the data that it holds and where the data does not cross check then the system will generally update the database to make it right. It is important to keep an eye on this process; this will be discussed in a later section.

As each entry is made the system will update the appropriate data and views to reflect the entries.

The order of entry should be in the logical progression but this is not essential as it can be changed.

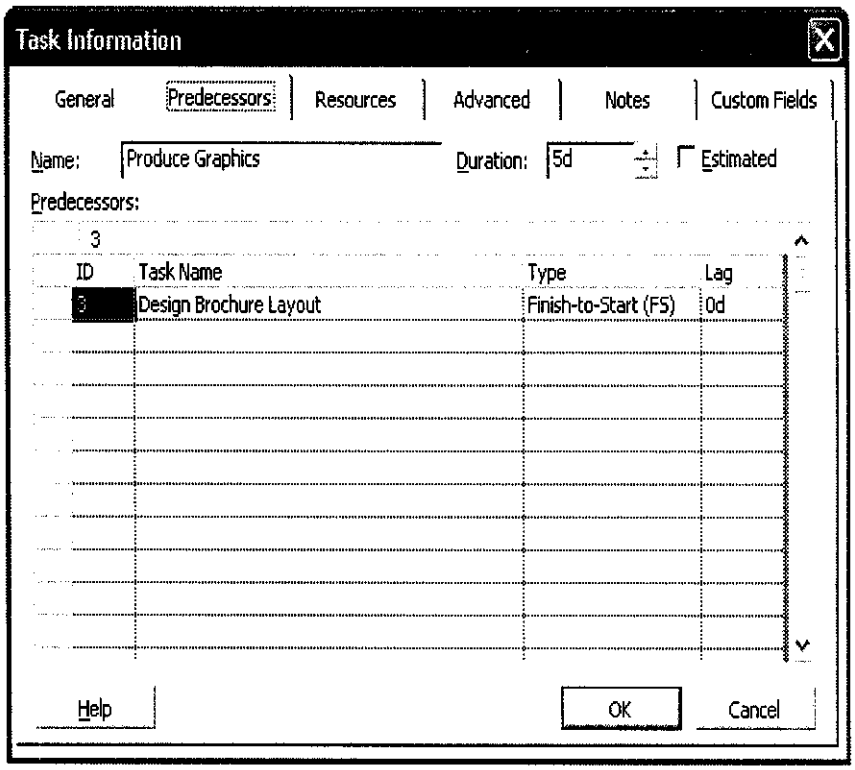
Normal Task entry will be by using the standard Task Sheet. The Gantt View shows the Gantt Chart in the right part of the window with the Task Sheet in the left part.

The Task Information box/Task Sheet



The Task sheet is a view of the selected task with information shown in the columns as follows: -

ID:	The Task Identification number.
Name:	The Name of the Task.
Duration:	The time the Task will take including the time units.
Start Date:	This is the current Scheduled Start date for the Task. Not the Planned or Actual Start.
Finish Date:	The Scheduled Finish date.
Predecessors:	The ID numbers for the preceding Tasks that are linked to this Task.
Resources:	The names of the resources performing or used in the Task.



2.4.4 Linking Tasks

In order that the system is able to display the overall time aspects of the project, each Task must be defined in terms of the Tasks on which it is dependent and in turn those Tasks that are dependent on it. It is also possible to define in what way these dependencies exist.

Most associated Tasks will have a straightforward linear relationship. That is, the preceding task must finish before the next task can start. This is the **Finish to Start** relationship.

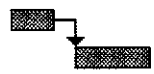
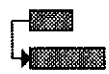
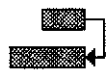
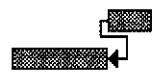
This is not true for all situations, for example if bricks are being made to build a house, the building cannot start until some bricks are available but it is

not necessary for all the bricks to be made before the building can start. The relationship between making the bricks and building the house can be described as **Start to Start** but with a time lag to allow for the first batch of bricks to be ready.

An alternative relationship can be **Finish to Finish** which is true where two tasks must be ready at the same time. For example in the preparation of a banquet, the elements of each course must be completed at the same time in order that they are at their best.

To summarise the main three relationships that can happen are as follows: -

- Finish to Start (FS)
- Start to Start (SS)
- Finish to Finish (FF)

Relationship	Description	Gantt Bar Chart Display
Finish-to-start (FS)	Task starts when its predecessor finishes.	
Start-to-start (SS)	Task starts when its predecessor starts.	
Finish-to-finish (FF)	Task finishes when its predecessor finishes.	
Start-to-finish (SF)	Task finishes when its predecessor starts.	

We can also fine tune these relationships by specifying Lag or Lead times as required.

Linking of Tasks can be achieved by making the appropriate entry in any of the task views or highlighting the tasks and using the link button on the Tool Bar, or by using the **Edit, Link Tasks** command

2.4.5 Resources

The management of resources is a major feature of MS Project. It is possible to see how each one is being used and determine the times when they are under or over utilised. The system can adjust the project to eliminate over allocation of a resource. We can think of resource data being stored in a database, which is the partner to the task database. The Microsoft Project system merges the data in the two databases to provide the facilities that are available.

efine the Resources

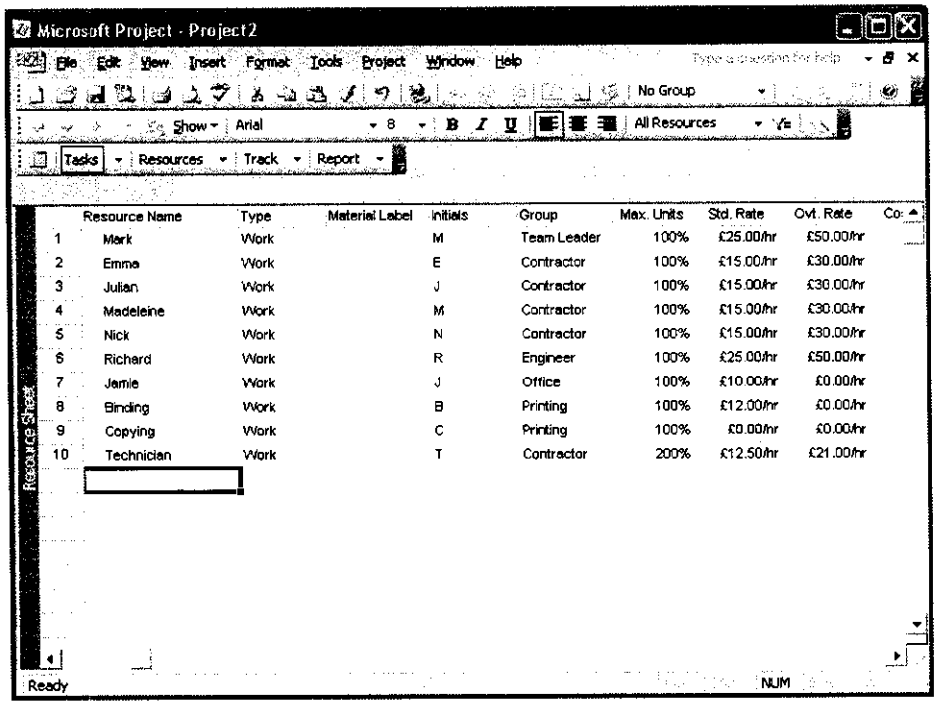
Complete the following table for the resources used in the Project Plan

ID	Name	Initials	Max Units	Std Rate	Ovt Rate	Cost/Use	Accrue

When you build a large pool of resources—for example, 200 employees—the best place to enter this information is in the Resource Sheet. If there are only a few resources working on the project, however, you might enter them "on the fly" using the Resource Assignment dialog box.

Reviewing and Navigating the Resource Sheet

The Resource Sheet contains an array of required fields for entering resources. A Resource Sheet is illustrated below:



	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Co:
1	Mark	Work		M	Team Leader	100%	£25.00/hr	£50.00/hr	
2	Emma	Work		E	Contractor	100%	£15.00/hr	£30.00/hr	
3	Julian	Work		J	Contractor	100%	£15.00/hr	£30.00/hr	
4	Madeleine	Work		M	Contractor	100%	£15.00/hr	£30.00/hr	
5	Nick	Work		N	Contractor	100%	£15.00/hr	£30.00/hr	
6	Richard	Work		R	Engineer	100%	£25.00/hr	£50.00/hr	
7	Jamie	Work		J	Office	100%	£10.00/hr	£0.00/hr	
8	Binding	Work		B	Printing	100%	£12.00/hr	£0.00/hr	
9	Copying	Work		C	Printing	100%	£0.00/hr	£0.00/hr	
10	Technician	Work		T	Contractor	200%	£12.50/hr	£21.00/hr	

Enter Resources :

There are two separate stages in adding resources to be managed by the system. They first must be entered in the resource sheet to identify them as being available. Secondly the available resources are associated with the respective tasks.

Adding Resource to the Resource Sheet :

The resources are added to the Resource Sheet in rows. The columns identify the fields. The table below summarizes the information that can be stored in the resource sheet.

Field	Description
esource Name	The name given to a resource. It can be the name of an individual or a type of group.
itials	The abbreviated name for the resource.
roup	A resource can be placed in a group, which can be used by a filter to show only group members, it is also possible to use the group name to view all members of the group together.
lax. Units	The percentage (number) of resource units available. This is applicable only if using a type of resource. For example, you might have three technicians, but you can have only one Emma Cheesman.
td. Rate	The standard cost of the resource per hour, week, or month.
vt. Cost	The overtime cost of the resource per hour, week, or month.
ost/Use	The cost of the resource every time it is used.
ccrue At	This field identifies when the cost of the resource is added to the running total of the project. The options are at the "Start", at the "End" or "Prorated" which means updated at the end of each time unit as the resource is used.
ase Calendar	The base calendar to which you assign the resource.
ode	You can assign an alphanumeric code to each resource. The Code field can be used to associate an accounting code for use of the resource. This is an additional method of allocating the costs of the project as required. and use it for sorting, filtering, and reporting.

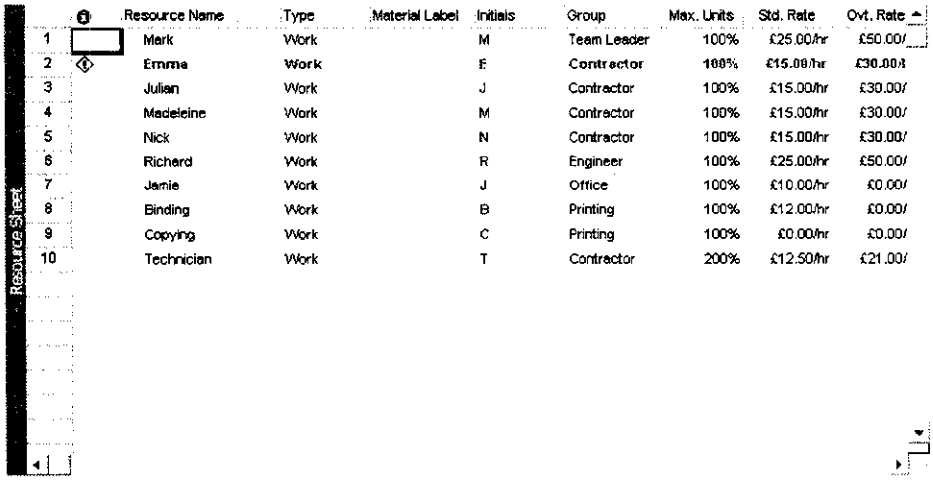
add resources to the Resource Sheet:

- From the **View** menu, choose Resource Sheet.
- In the Resource Name cell, type the Resource Name.
- Press **TAB**
- Type the necessary information.
- Repeat steps 3 and 4 until you have entered all the information needed for the resource.
- Press **ENTER**
- Press **HOME**
- Repeat steps 2 through 7 for each resource.

The Resource Graph

The best use of this view is in the lower pane with the Gantt Chart at the top. The Resource Graph will only show one resource at a time and will automatically switch to the resource allocated to the task highlighted in the top pane. One great value of this view is that it shows you when a resource is over-allocated.

See below, where Emma is over-resourced.



	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate
1	Mark	Work		M	Team Leader	100%	£25.00/hr	£50.00/
2	Emma	Work		E	Contractor	100%	£15.00/hr	£30.00/
3	Julian	Work		J	Contractor	100%	£15.00/hr	£30.00/
4	Madeleine	Work		M	Contractor	100%	£15.00/hr	£30.00/
5	Nick	Work		N	Contractor	100%	£15.00/hr	£30.00/
6	Richard	Work		R	Engineer	100%	£25.00/hr	£50.00/
7	Jamie	Work		J	Office	100%	£10.00/hr	£0.00/
8	Binding	Work		B	Printing	100%	£12.00/hr	£0.00/
9	Copying	Work		C	Printing	100%	£0.00/hr	£0.00/
10	Technician	Work		T	Contractor	200%	£12.50/hr	£21.00/

Resource Sheet

2.4.6 Resource Graph

The Resource Graph is used to display the usage of a single resource and will highlight the times the resource is over allocated.

The Graph can be accessed from the **view** pull down menu and will show the current selected resource

Resource Levelling

Levelling is the process of moving tasks in the time scale to redistribute the use of resources where they are over allocated.

This process can be automatic whenever there is a resource over allocation or manually from the **Tools** pull down menu.

Levelling Resources

View the **Resource Usage** and the **Resource Graph** and where there is an over allocation, consider methods of correcting them.

Planned Time Scale

When all the tasks and resources have been added and any resource problems cleared and provided the scheduled dates are acceptable, this marks the completion of the design and planning stage.

Lead Time and Lag Time

Certain tasks can be started before other tasks are completed.

For example Slide Development can start any time after Module 1.

Set lead time on Slide Development:

- Select the task.
- Open the Task Information box.
- Select the Predecessor Tab.
- Change the type from 'Finish to Start' to 'Finish to Finish'.
- In the Lag box type .5d.

Using Gantt Charts

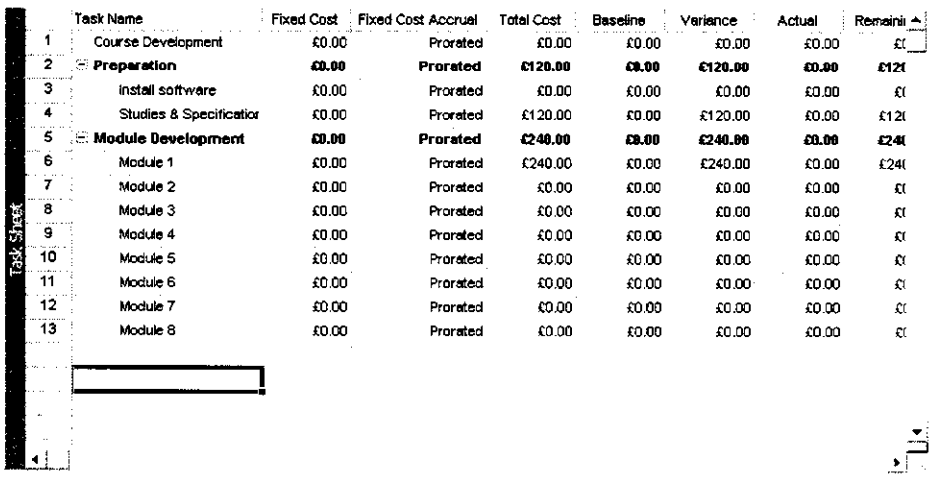
View the Gantt Chart

- Select **Gantt Chart** from the **View** menu.
- Place the pointer on the border between chart and table, hold the button down and drag the border left or right.
- From the **Format** menu, select **Timescale**. Try changing the major and minor scales as view the changes at the bottom of the box.
- From the View, menu choose Zoom. Try out the various changes that can be made to the amount seen.

2.4.7 Examining the Cost Factor

When all the tasks and their associated resources have been entered, it is possible to view the calculated costs of the project and there are several views that can be used.

The first view is the Task Sheet together with the Cost Table (**View, Table, Cost**).



Task Sheet

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Actual	Remaini
1	Course Development	£0.00	Prorated	£0.00	£0.00	£0.00	£0.00	£(
2	**Preparation**	**£0.00**	**Prorated**	**£120.00**	**£0.00**	**£120.00**	**£0.00**	**£12(**
3	Install software	£0.00	Prorated	£0.00	£0.00	£0.00	£0.00	£(
4	Studies & Specificatior	£0.00	Prorated	£120.00	£0.00	£120.00	£0.00	£12(
5	**Module Development**	**£0.00**	**Prorated**	**£240.00**	**£0.00**	**£240.00**	**£0.00**	**£24(**
6	Module 1	£0.00	Prorated	£240.00	£0.00	£240.00	£0.00	£24(
7	Module 2	£0.00	Prorated	£0.00	£0.00	£0.00	£0.00	£(
8	Module 3	£0.00	Prorated	£0.00	£0.00	£0.00	£0.00	£(
9	Module 4	£0.00	Prorated	£0.00	£0.00	£0.00	£0.00	£(
10	Module 5	£0.00	Prorated	£0.00	£0.00	£0.00	£0.00	£(
11	Module 6	£0.00	Prorated	£0.00	£0.00	£0.00	£0.00	£(
12	Module 7	£0.00	Prorated	£0.00	£0.00	£0.00	£0.00	£(
13	Module 8	£0.00	Prorated	£0.00	£0.00	£0.00	£0.00	£(

This view will list all the tasks as originally entered and the associated columns will contain the cost data in terms of the Planned cost, the Actual cost and how much has been used so far.

This table is very useful in identifying those tasks that are causing the greatest pressure on the total cost of the project.

Second way is to chose the Resource Usage then use **Format, Details,** and choose **Cost** or **Cumulative Cost.**

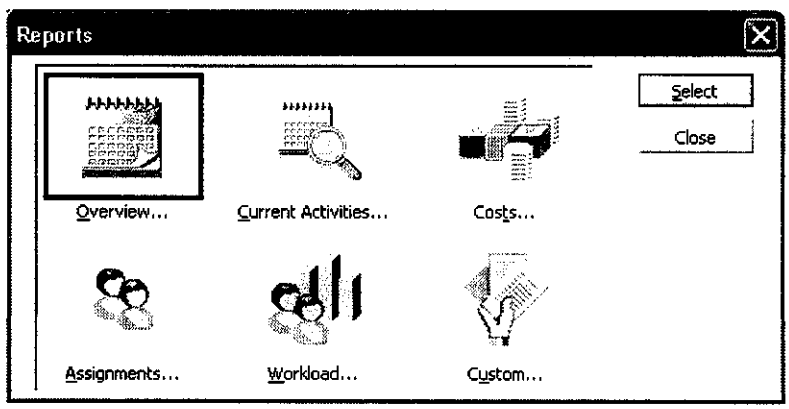
View the Cost Factors

Select View, Resource Usage then choose Format, Details.

2.4.8 Reports Setup

MS Project has a number of pre-defined reports based on six principal types which can be used directly, changed as required. Alternatively, completely new reports can be created. The system is picture driven and simple to use.

Access is from the **View, Reports** command. A dialog box appears in which the following type of report can be chosen:



Overview: Summarizes the most significant project information, including numbers of tasks and resources, task and schedule status, costs, start

and finish dates, and so on.

Current Activities: Displays information about top-level tasks for the entire project. Includes summary tasks and task notes.

Costs: Shows critical tasks for the entire project. Includes summary and successor tasks and task notes.

Assignments: Shows project milestones. Includes summary tasks and task notes.

Workload: Shows working and nonworking times for resources for the entire project duration.

Custom: Use an existing report to create a new one.

After selecting one of the above you then choose **Select** and a second box will appear that will have a number of pre-defined options depending on the base of the report.

The Gantt Chart and the Critical Path

This is the selection of tasks that together directly effect the completion date of the project.

This is because of the way the tasks are linked. If any of the tasks slip then this will be directly reflected in the completion date.

Modifying the Project to Match Resources

When a project is first planned, one of the checks that must be made is that the resources are not over allocated. The previous topic showed how the system could be used to locate over allocated resources.

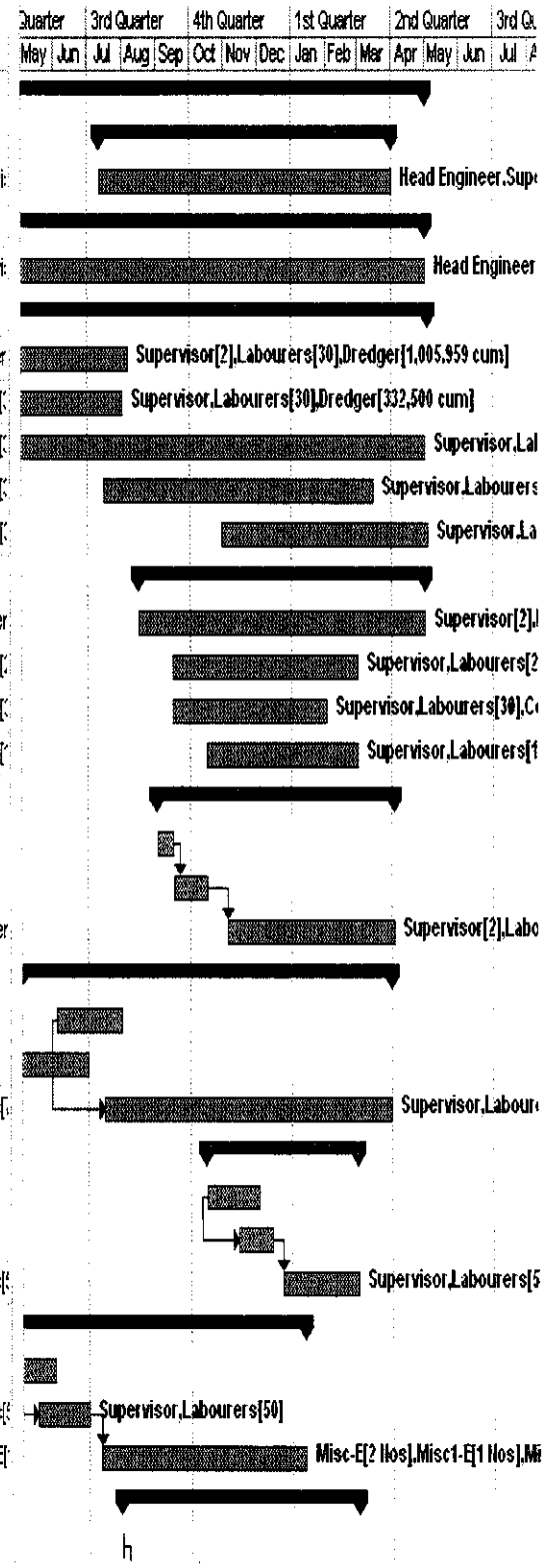
To remedy an over allocation there are three alternatives as follows:

- The capacity of the over allocated resource can be increased to eliminate the over allocation.
- The time scale of the tasks involved in the problem can be changed to eliminate the over allocation.
- The amount of resource used can be shortened by using a factor for the amount of actual time spent **e.g.** using **[0.5]** for half.

2.5 MSP OUTPUTS

2.5.1 ACTIVITIES AND GANTT CHART

	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	**Port phase 1**	426 days	Mon 12/21/09	Sat 4/30/11		
2	**Berths Construction**	**226 days**	**Mon 7/12/10**	**Thu 3/31/11**		
3	Berth construction	226 days	Mon 7/12/10	Thu 3/31/11		Head Engineer,Supervi
4	**Breakwaters Construct**	**423 days**	**Thu 12/24/09**	**Sat 4/30/11**		
5	Beakwater constructi	423 days	Thu 12/24/09	Sat 4/30/11		Head Engineer,Supervi
6	**Dredging**	**392 days**	**Sat 1/30/10**	**Mon 5/2/11**		**Head Engineer**
7		154.69 days	Mon 2/8/10	Fri 8/6/10		Supervisor[2],Labourer
8	Using small dredgers	157 days	Sat 1/30/10	Sat 7/31/10		Supervisor,Labourers[
9	Marg Cauvery	390 days	Mon 2/1/10	Sat 4/30/11		Supervisor,Labourers[
10	Outsourced CSD	208 days	Thu 7/15/10	Mon 3/14/11		Supervisor,Labourers[
11	Large external Dredge	159 days	Fri 10/29/10	Mon 5/2/11		Supervisor,Labourers[
12	**Buildings**	**222 days**	**Mon 8/16/10**	**Sat 4/30/11**		**Head Engineer**
13	Administration Building	222 days	Mon 8/16/10	Sat 4/30/11		Supervisor[2],Labourer
14	Control Tower	143 days	Wed 9/15/10	Mon 2/28/11		Supervisor,Labourers[
15	Substation	119 days	Wed 9/15/10	Mon 1/31/11		Supervisor,Labourers[
16	Ware house	117 days	Fri 10/15/10	Mon 2/28/11		Supervisor,Labourers[
17	**Roads and drainage**	**184 days**	**Wed 9/1/10**	**Sat 4/2/11**		**Head Engineer**
18	Design finalisation	13 days	Wed 9/1/10	Wed 9/15/10		
19	Bidding process	27 days	Thu 9/16/10	Sat 10/16/10	18	
20	Implementation	130 days	Wed 11/3/10	Sat 4/2/11	19FS+14 days	Supervisor[2],Labourer
21	**Compound wall**	**287 days**	**Sat 5/1/10**	**Thu 3/31/11**		**Head Engineer**
22	Design finalisation	51 days	Wed 6/2/10	Fri 7/30/10		
23	Bidding process	52 days	Sat 5/1/10	Wed 6/30/10		
24	Implementation	223 days	Thu 7/15/10	Thu 3/31/11	22SS+15 days	Supervisor,Labourers[
25	**Water supply arrangem**	**117 days**	**Fri 10/15/10**	**Mon 2/28/11**		**Head Engineer**
26	Design finalisation	41 days	Fri 10/15/10	Wed 12/1/10		
27	Bidding process	26 days	Sat 11/13/10	Mon 12/13/10	26SS+25 days	
28	Implementation	59 days	Wed 12/22/10	Mon 2/28/11	27FS+7 days	Supervisor,Labourers[
29	**Electrical Installations**	**245 days**	**Thu 4/1/10**	**Tue 1/11/11**		**Head Engineer**
30	Finalisation of requirer	52 days	Thu 4/1/10	Mon 5/31/10		
31	Initiating bidding proce	40 days	Sat 5/15/10	Wed 6/30/10	30SS+25 days	Supervisor,Labourers[
32	Implementation	158 days	Mon 7/12/10	Tue 1/11/11	31FS+9 days	Misc-E[2 Nos],Misc1-E[
33	**Wharf Cranes**	**183 days**	**Fri 7/30/10**	**Mon 2/28/11**		**Head Engineer**
34	Award of Order	1 day	Fri 7/30/10	Fri 7/30/10		

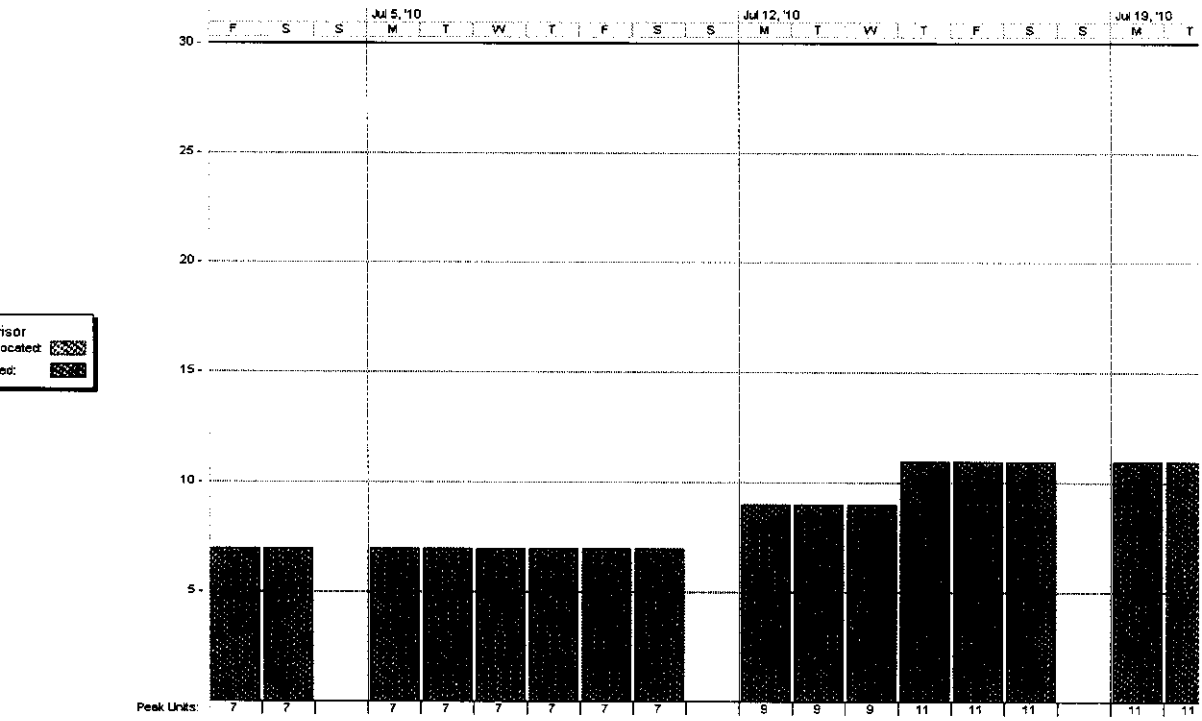


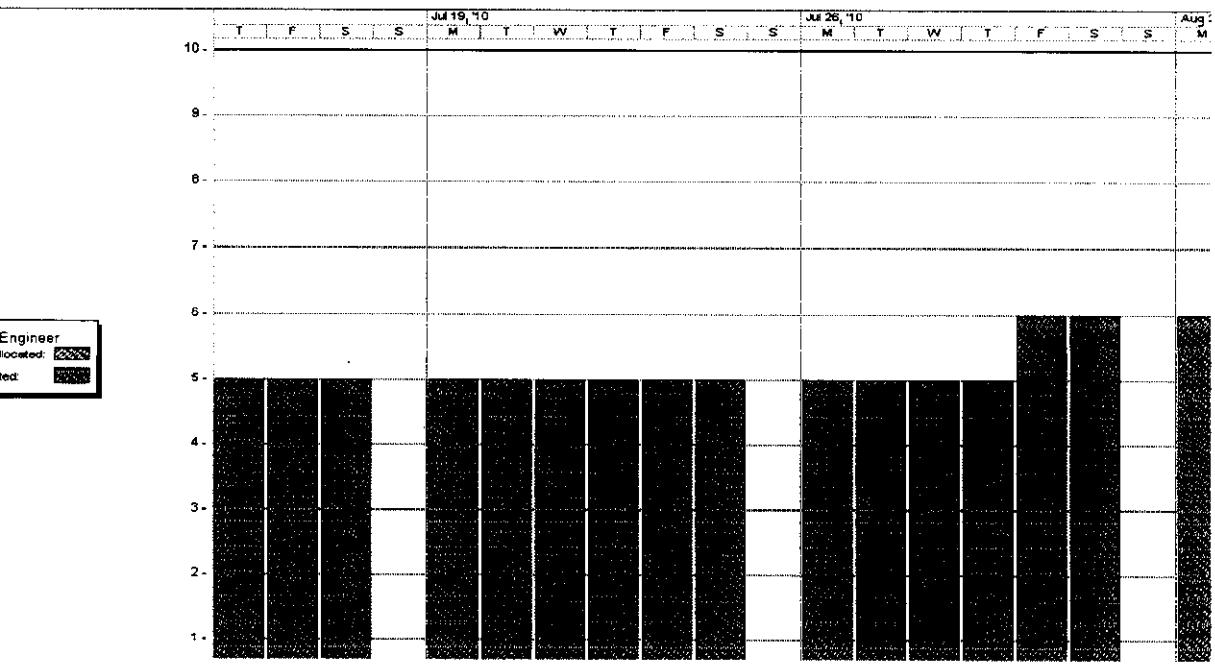
2.5.2 GANTT CHART

2.5.3 RESOURCE SHEET

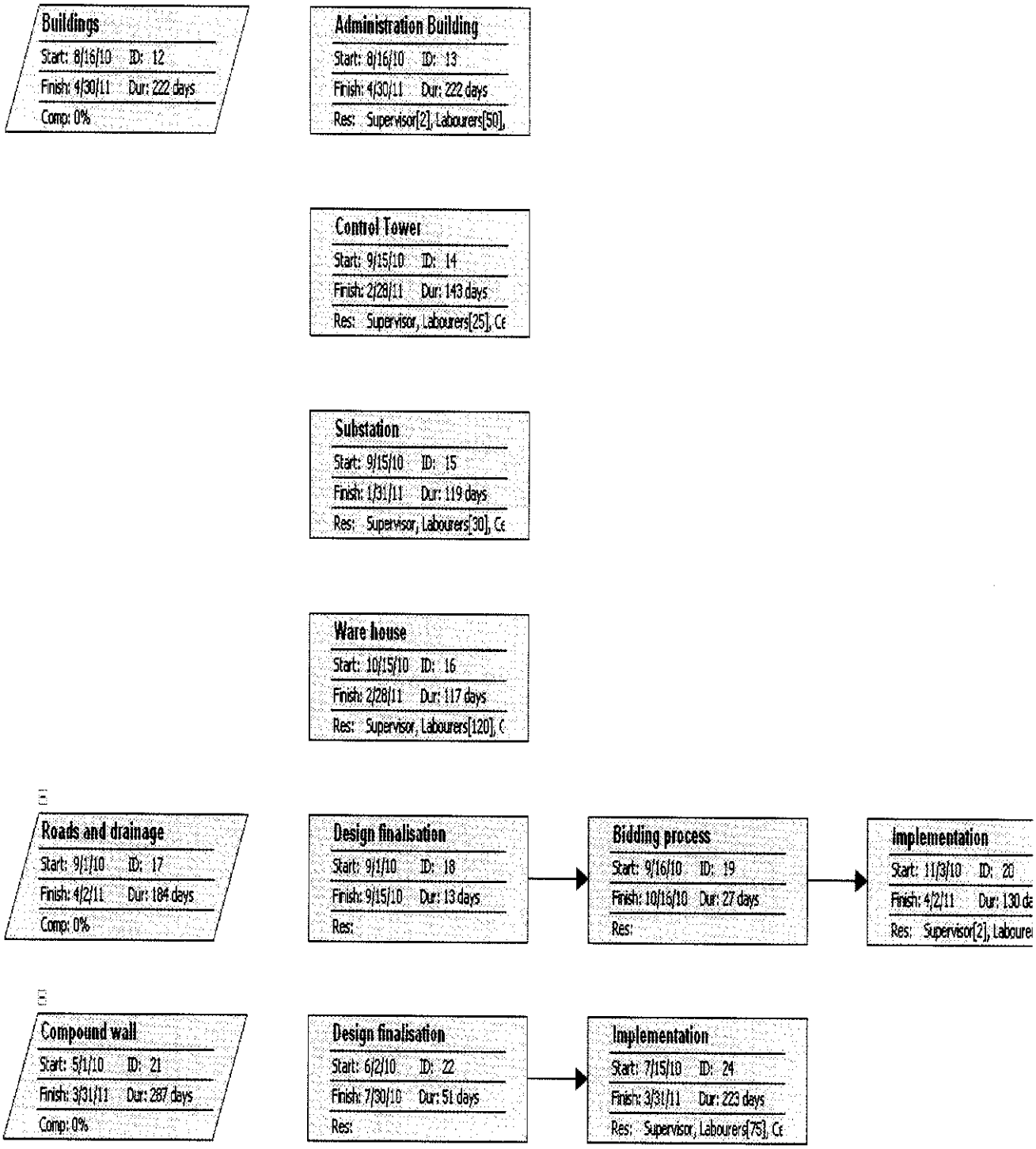
	Resource Name	Type	Material Label	Initials	Max. Units	Std. Rate	Ovt. Rate	Accrue At	Base Calendar	Code
1	Head Engineer	Work		H	10	rs2,000.00/day	rs0.00/hr	Prorated	Calendar 1	
2	Supervisor	Work		S	30	rs500.00/day	rs0.00/hr	Prorated	Calendar 1	
3	Labourers	Work		L	1,075	rs250.00/day	rs0.00/hr	Prorated	Calendar 1	
4	Dredger	Material	cum	D		rs194.00		Prorated		
5	Cement	Material	bags	C		rs280.00		Prorated		
6	Steel	Material	tonnes	S		rs38,000.00		Prorated		
7	Sand	Material	cum	S		rs671.00		Prorated		
8	Boulders	Material	tonnes	B		rs450.00		Prorated		
9	Aggregates	Material	cum	A		rs813.00		Prorated		
10	Bricks	Material	no	B		rs3.75		Prorated		
11	Embankment/Subgrad	Material	cum	E		rs100.00		Prorated		
12	GSB	Material	cum	G		rs750.00		Prorated		
13	WMM	Material	cum	W		rs1,100.00		Prorated		
14	Dry Lean Concrete (C	Material	cum	D		rs3,500.00		Prorated		
15	Paving Concrete	Material	cum	P		rs5,200.00		Prorated		
16	Misc	Material	metre	M		rs10.00		Prorated		
17	Misc-E	Material	Nos	M		rs900,000.00		Prorated		
18	Misc1-E	Material	Nos	M		rs2,000,000.00		Prorated		
19	Misc2-E	Material	Nos	M		rs300,000.00		Prorated		
20	Misc3-E	Material	Nos	M		rs500,000.00		Prorated		
21	Cables	Material	metre	C		rs425.00		Prorated		
22	MCB	Material	Nos	M		rs300,000.00		Prorated		
23	Misc4-E	Material	Nos	M		rs213,600.00		Prorated		
24	Crane	Material	Nos	C		rs583,527,155.00		Prorated		
25	Fairway Buoy Systen	Material	Nos	F		rs1,653,500.00		Prorated		
26	Channel Marking and	Material	Nos	C		rs4,000,000.00		Prorated		
27	Isolated Danger marki	Material	Nos	I		rs720,000.00		Prorated		
28	Jetty corners marking	Material	Nos	J		rs228,000.00		Prorated		
29	Front & Rear leading l	Material	Nos	F		rs1,200,000.00		Prorated		
30	Front & Rear leading l	Material	Nos	F		rs1,500,000.00		Prorated		
31	Breakwater lights	Material	Nos	B		rs609,000.00		Prorated		
32	Remote Monitoring Sy	Material	Nos	R		rs1,125,000.00		Prorated		

2.5.4 RESOURCE GRAPHS





2.5.5 NETWORK DIAGRAM



2.6 REPORTS

2.6.1 Project Summary :

Port

as of Mon 4/20/09

Dates			
Start:	Mon 12/21/09	Finish:	Mon 5/2/11
Baseline Start:	NA	Baseline Finish:	NA
Actual Start:	NA	Actual Finish:	NA
Start Variance:	0 days	Finish Variance:	0 days

Duration			
Scheduled:	427 days	Remaining:	427 days
Baseline:	0 days?	Actual:	0 days
Variance:	427 days	Percent Complete:	0 %

Work			
Scheduled:	1,783,752 hrs	Remaining:	1,783,752 hrs
Baseline:	0 hrs	Actual:	0 hrs
Variance:	1,783,752 hrs	Percent Complete:	0 %

Costs			
Scheduled:	rs4,239,538,788.75	Remaining:	rs4,239,538,788.75
Baseline:	rs0.00	Actual:	rs0.00
Variance:	rs4,239,538,788.75		

Task Status	
Tasks not yet started:	40
Tasks in progress:	0
Tasks completed:	0
Total Tasks:	40

Resource Status	
Work Resources:	3
Overallocated Work Resources:	0
Material Resources:	29
Total Resources:	32

.6.2 Budget :

Budget Report as of Mon 4/20/09
Port

ID	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance
36	Assembling & Commissioning	rs0.00	Prorated	rs1,167,054,310.00	rs0.00	rs1,167,054,310.00
11	Large external Dredger	rs0.00	Prorated	rs699,672,000.00	rs0.00	rs699,672,000.00
9	Main Canvey	rs0.00	Prorated	rs633,620,000.00	rs0.00	rs633,620,000.00
5	Breakwater construction	rs0.00	Prorated	rs437,604,292.00	rs0.00	rs437,604,292.00
10	Outsourced CCD	rs0.00	Prorated	rs389,664,000.00	rs0.00	rs389,664,000.00
3	Berth construction	rs0.00	Prorated	rs387,677,177.00	rs0.00	rs387,677,177.00
7		rs0.00	Prorated	rs196,479,889.75	rs0.00	rs196,479,889.75
32	Implementation	rs0.00	Prorated	rs101,430,000.00	rs0.00	rs101,430,000.00
6	Using small dredgers	rs0.00	Prorated	rs65,761,000.00	rs0.00	rs65,761,000.00
16	Ware house	rs0.00	Prorated	rs51,948,053.00	rs0.00	rs51,948,053.00
13	Administration Building	rs0.00	Prorated	rs29,830,833.00	rs0.00	rs29,830,833.00
40	Assembling & Commissioning	rs0.00	Prorated	rs26,062,500.00	rs0.00	rs26,062,500.00
24	Implementation	rs0.00	Prorated	rs17,536,263.00	rs0.00	rs17,536,263.00
15	Substation	rs0.00	Prorated	rs10,999,303.00	rs0.00	rs10,999,303.00
28	Implementation	rs0.00	Prorated	rs10,767,000.00	rs0.00	rs10,767,000.00
14	Control Tower	rs0.00	Prorated	rs4,222,257.00	rs0.00	rs4,222,257.00
35	Lead time	rs0.00	Prorated	rs1,950,000.00	rs0.00	rs1,950,000.00
20	Implementation	rs0.00	Prorated	rs1,776,911.00	rs0.00	rs1,776,911.00
39	Lead time	rs0.00	Prorated	rs1,326,000.00	rs0.00	rs1,326,000.00
31	Initiating bidding process	rs0.00	Prorated	rs520,000.00	rs0.00	rs520,000.00
1	Port phase 1	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
18	Design finalization	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
19	Bidding process	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
22	Design finalization	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
23	Bidding process	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
26	Design finalization	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
27	Bidding process	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
30	Finalization of requirement	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
34	Award of Order	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
38	Award of Order	rs0.00	Prorated	rs0.00	rs0.00	rs0.00
		rs0.00		rs4,235,992,788.75	rs0.00	rs4,235,992,788.75

.6.3 Assignments :

Who Does What as of Mon 4/20/09
Port

ID	Resource Name	Work
1	Head Engineer	19,376 hrs

ID	Task Name	Units	Work	Delay	Start	Finish
3	Berth construction	1	1,000 hrs	0 days	Mon 9/12/10	Thu 3/3/11
5	Backwater construction	1	3,364 hrs	0 days	Thu 12/24/09	Sat 4/30/11
6	Dredging	1	3,136 hrs	0 days	Sat 1/30/10	Mon 6/2/11
12	Buildings	1	1,776 hrs	0 days	Mon 6/15/10	Sat 4/30/11
17	Roads and drainage	1	1,472 hrs	0 days	Wed 9/1/10	Sat 4/2/11
21	Compound wall	1	2,296 hrs	0 days	Sat 6/5/10	Thu 3/3/11
26	Water supply arrangements	1	936 hrs	0 days	Fri 10/15/10	Mon 2/28/11
29	Electrical installations	1	1,960 hrs	0 days	Thu 4/1/10	Tue 1/1/11
33	Wharf Cranes	1	1,464 hrs	0 days	Fri 7/30/10	Mon 2/28/11
37	Navigational Aids	1	1,144 hrs	0 days	Wed 9/15/10	Mon 2/28/11
2	Superisor		36,811 hrs			

ID	Task Name	Units	Work	Delay	Start	Finish
3	Berth construction	2	3,616 hrs	0 days	Mon 9/12/10	Thu 3/3/11
5	Backwater construction	3	10,152 hrs	0 days	Thu 12/24/09	Sat 4/30/11
7		2	2,476 hrs	0 days	Mon 2/8/10	Fri 6/6/10
8	Using small dredgers	1	1,288 hrs	0 days	Sat 1/30/10	Sat 7/3/10
9	Marg Delivery	1	3,120 hrs	0 days	Mon 2/1/10	Sat 4/30/11
10	Outsourced D&D	1	1,664 hrs	0 days	Thu 7/15/10	Mon 3/14/11
11	Large external Dredger	1	1,272 hrs	0 days	Fri 10/29/10	Mon 6/2/11
13	Administration Building	2	3,552 hrs	0 days	Mon 6/15/10	Sat 4/30/11
14	Control Tower	1	1,144 hrs	0 days	Wed 9/15/10	Mon 2/28/11
15	Substation	1	962 hrs	0 days	Wed 9/15/10	Mon 3/1/11
16	Ware house	1	936 hrs	0 days	Fri 10/15/10	Mon 2/28/11
20	Implementation	2	2,080 hrs	0 days	Wed 1/3/10	Sat 4/2/11
24	Implementation	1	1,784 hrs	0 days	Thu 7/15/10	Thu 3/3/11
28	Implementation	1	472 hrs	0 days	Wed 12/22/10	Mon 2/28/11
31	Initiating bidding process	1	320 hrs	0 days	Sat 6/15/10	Wed 6/30/10
35	Lead time	1	1,200 hrs	0 days	Sat 7/3/10	Fri 1/21/11
39	Lead time	1	616 hrs	0 days	Thu 9/16/10	Wed 1/12/11
3	Laborers		1,727,565 hrs			

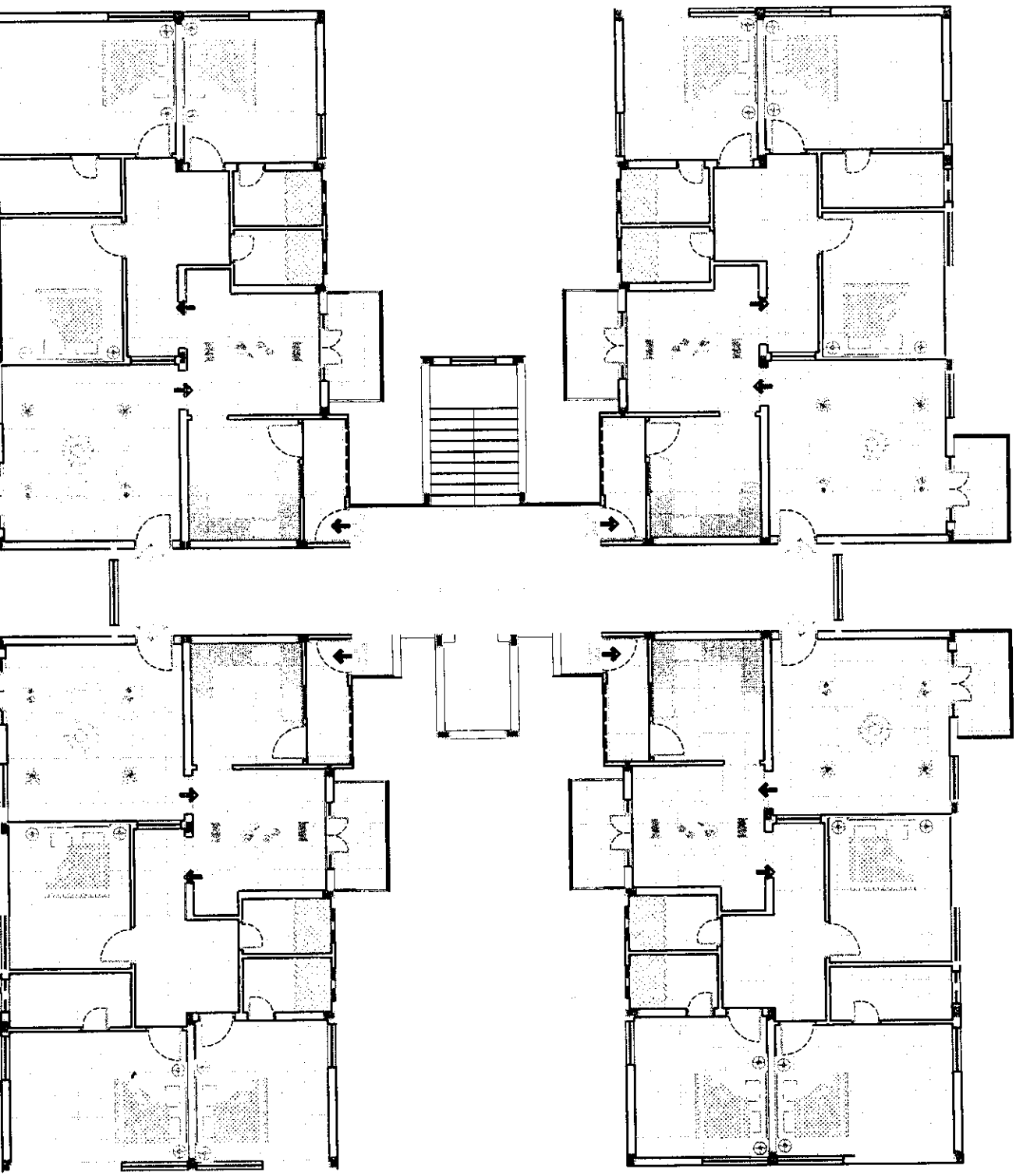
ID	Task Name	Units	Work	Delay	Start	Finish
3	Berth construction	350	632,800 hrs	0 days	Mon 9/12/10	Thu 3/3/11
5	Backwater construction	76	263,600 hrs	0 days	Thu 12/24/09	Sat 4/30/11
7		30	37,128 hrs	0 days	Mon 2/8/10	Fri 6/6/10
8	Using small dredgers	30	37,680 hrs	0 days	Sat 1/30/10	Sat 7/3/10
9	Marg Delivery	30	93,600 hrs	0 days	Mon 2/1/10	Sat 4/30/11
10	Outsourced D&D	30	49,920 hrs	0 days	Thu 7/15/10	Mon 3/14/11
11	Large external Dredger	30	38,160 hrs	0 days	Fri 10/29/10	Mon 6/2/11
13	Administration Building	60	88,800 hrs	0 days	Mon 6/15/10	Sat 4/30/11
14	Control Tower	26	28,600 hrs	0 days	Wed 9/15/10	Mon 2/28/11
15	Substation	30	28,860 hrs	0 days	Wed 9/15/10	Mon 3/1/11
16	Ware house	120	112,320 hrs	0 days	Fri 10/15/10	Mon 2/28/11
20	Implementation	60	62,000 hrs	0 days	Wed 1/3/10	Sat 4/2/11
24	Implementation	75	133,800 hrs	0 days	Thu 7/15/10	Thu 3/3/11
28	Implementation	60	28,800 hrs	0 days	Wed 12/22/10	Mon 2/28/11
31	Initiating bidding process	60	19,200 hrs	0 days	Sat 6/15/10	Wed 6/30/10
35	Lead time	60	60,000 hrs	0 days	Sat 7/3/10	Fri 1/21/11
39	Lead time	60	40,500 hrs	0 days	Thu 9/16/10	Wed 1/12/11

6.4 Workload :

Resource Usage as of Mon 4/20/09
Port

	12/21/09	12/28/09	1/4/10	1/11/10	1/18/10	1/25/10
Head Engineer	24 hrs	48 hrs	48 hrs	48 hrs	48 hrs	56 hrs
Berth construction						
Breakwater construction	24 hrs	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
Dredging						8 hrs
Buildings						
Roads and drainage						
Compound wall						
Water supply arrangements						
Electrical installations						
Wharf Cranes						
Navigational Aids						
Supervisor	72 hrs	144 hrs	144 hrs	144 hrs	144 hrs	152 hrs
Berth construction						
Breakwater construction	72 hrs	144 hrs	144 hrs	144 hrs	144 hrs	144 hrs
Using small dredgers						8 hrs
Barge Carrier						
Contoured CSD						
Large external Dredger						
Administration Building						
Control Tower						
Substation						
Ware house						
Implementation						
Implementation						
Implementation						
Initating bidding process						
Lead time						
Lead time						
Laborers	1,800 hrs	3,600 hrs	3,600 hrs	3,600 hrs	3,600 hrs	3,840 hrs
Berth construction						
Breakwater construction	1,800 hrs	3,600 hrs	3,600 hrs	3,600 hrs	3,600 hrs	3,600 hrs
Using small dredgers						240 hrs
Barge Carrier						
Contoured CSD						
Large external Dredger						
Administration Building						
Control Tower						
Substation						
Ware house						
Implementation						

2.7 LAYOUT OF MULTISTORIED BUILDING



TYPICAL FLOOR PLAN

2.7.1 LAYOUT EXPLANATION

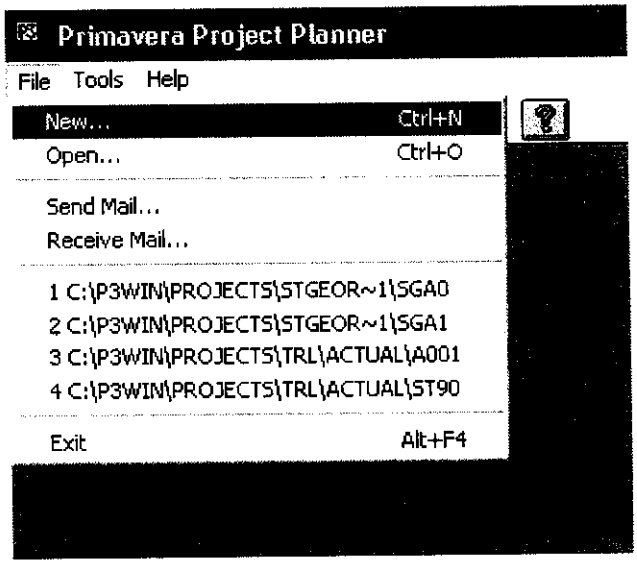
The figure under 2.7 shows the site layout of the apartment complex. The west facing site has an approach road of about 12m wide. The proposed building is located on the rear side of the site with landscaping in the front.

A typical floor plan of the apartment complex is also shown. It consists of Ground +3 floors. The proposed residential building is to accommodate four flats in each floor. Every flat has a living room, dinning, one master bedroom, two other bedrooms and a kitchen. There are two balconies, one extending from the living and the other from the dinning.

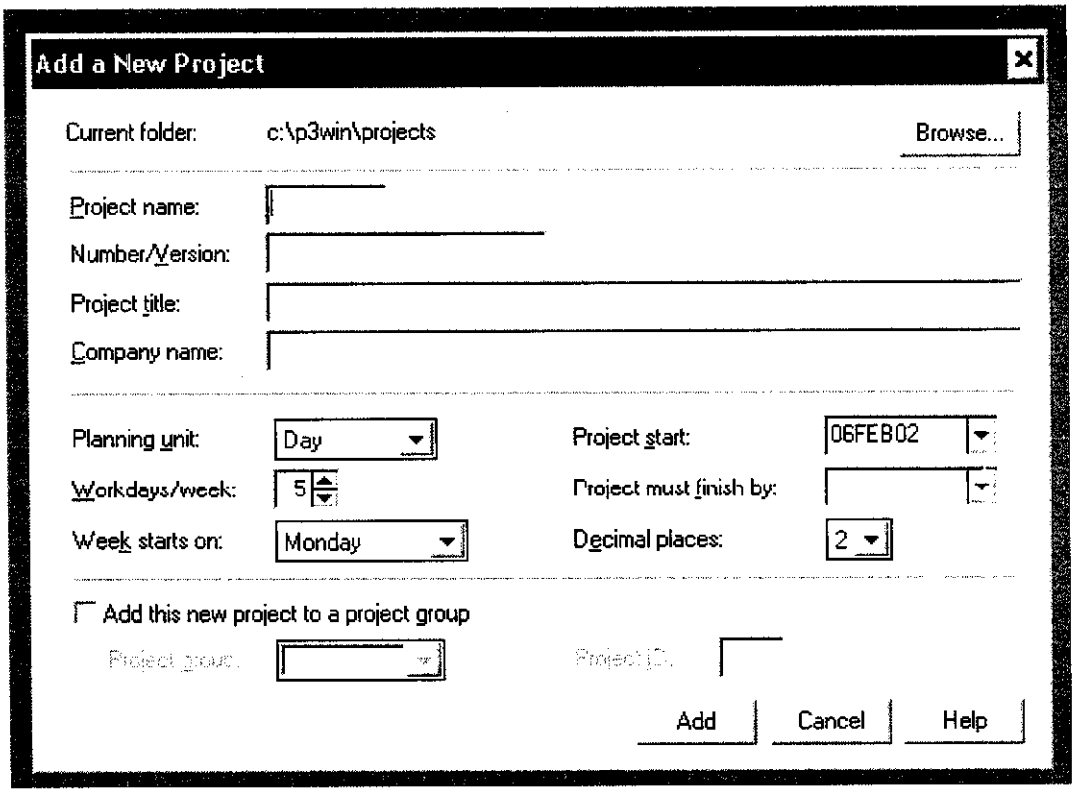
A separate service entrance is also provided. The wide corridor houses the staircase and lift facilities.

2.8 PRIMAVERA PROCEDURE

To start on your first programme you need to select the menu "File" and Option "New"



This will open this menu on-screen:



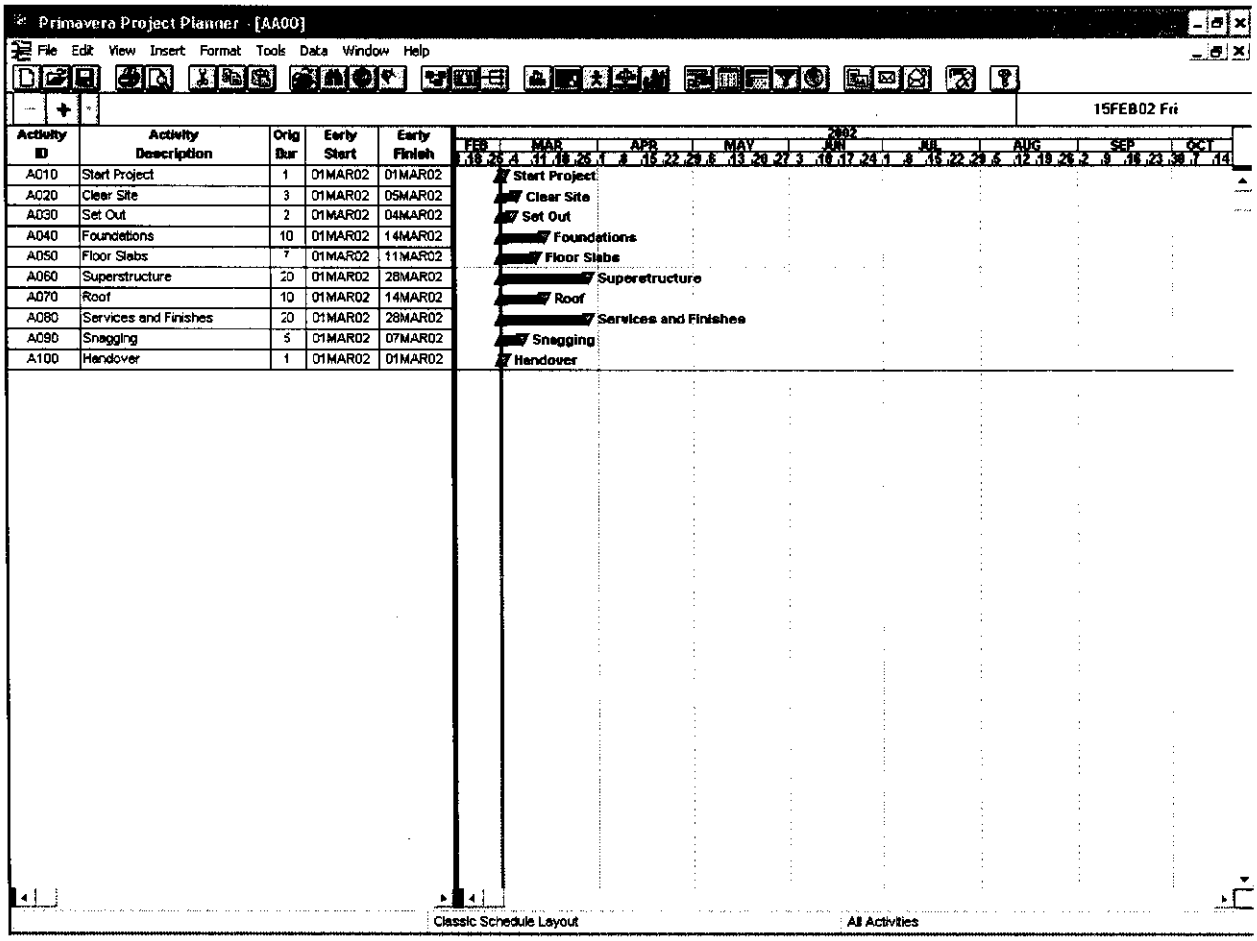
2.8.1 Entering Activities :

The calendar is set. Two types of calendar is used. One is global calendar and the second one is individual calendar (6 days work).

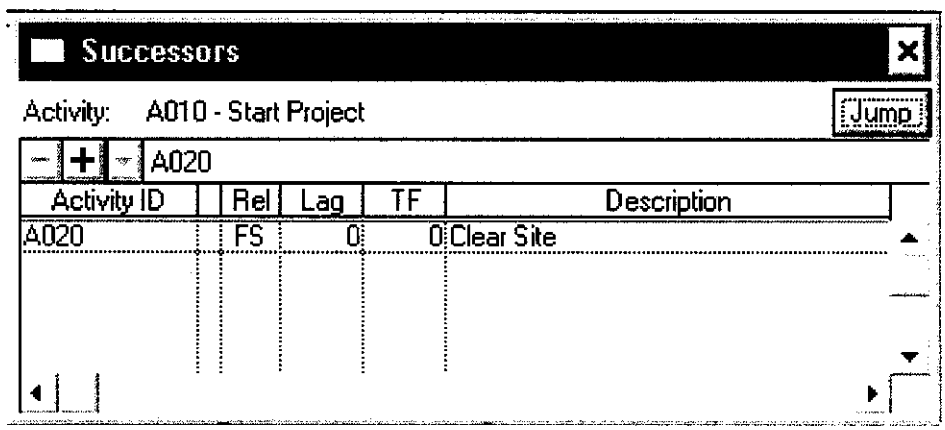
Before continuing any further you must enter the first "Activity ID" or activity number. All future Activity IDs will follow this number sequentially, increasing the number by a fixed amount. The Activity ID can be Alphanumeric.

Enter "A010" and either press enter or click the mouse cursor on the tick. There will be a thick black line around the Activity ID box indicating that this is the field being edited. Press the right arrow to highlight the "Activity Description" box, and enter "Start Project" in this field.

Once entered, it should look like this:



Now the activities are linked in the following manner.



The "Rel" column indicates the type of relationship that exists between the two activities. In this case it is a FS – Finish toStart, but could be a Finish-Finish, Start-Start or Start-Finish.The Lag indicates any Lag you want to put on the link.

For instance, if it was a FS with +3 days lag, the second activity could only start three days after the finish of the first. Likewise a SS with +5 days lag would mean that the second activity could only start five days after the start of the first.

The lag can be negative. For instance, a FS relationship with a -3 day lag would mean that activity two could start three days before the end of activity one.

In the same way the predecessors are also done.

2.8.2 Scheduling :

Schedule is to calculate the start and finish dates for each activity, hence we will produce the finish date of the project.

It is done after finishing inputting activities and relationships.

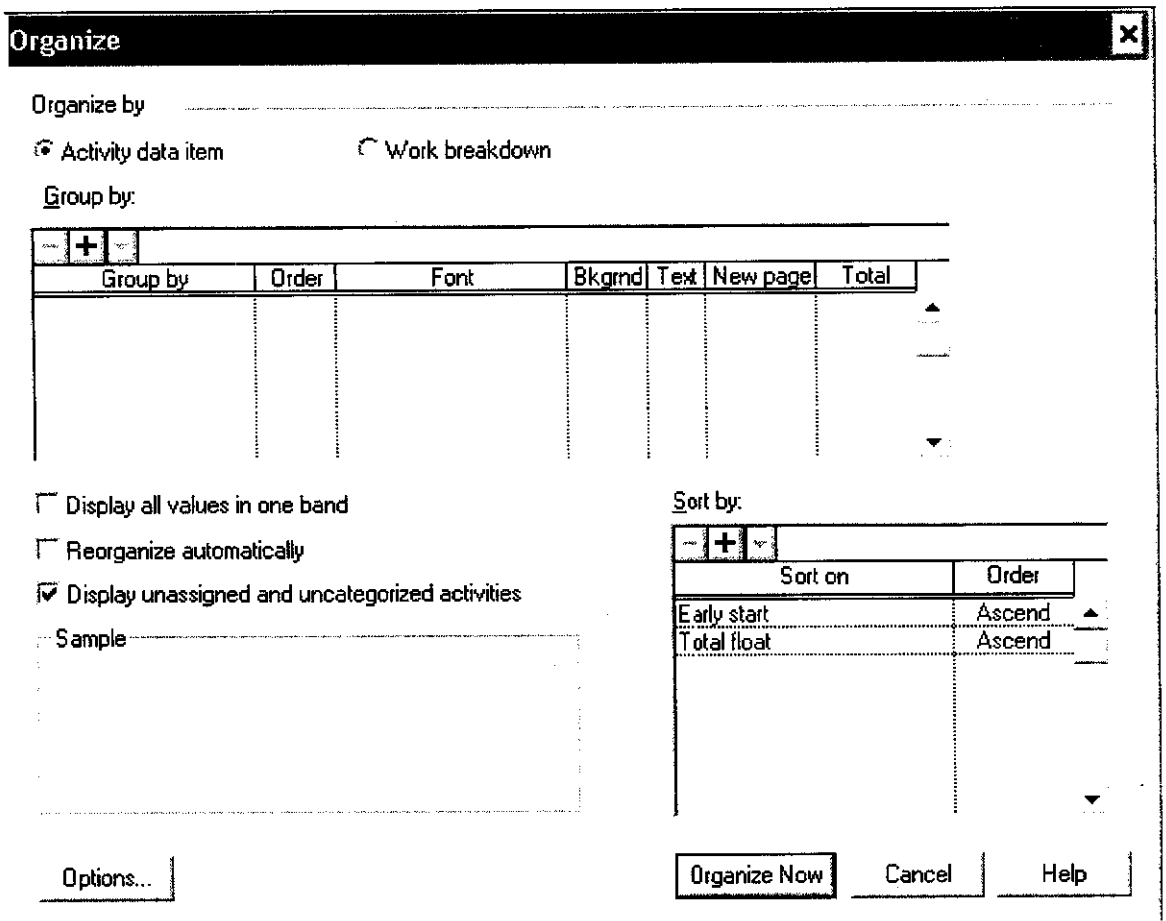
It is done either automatically or manually.

2.8.3 Organising :

It is used to sort and re-group the activities.

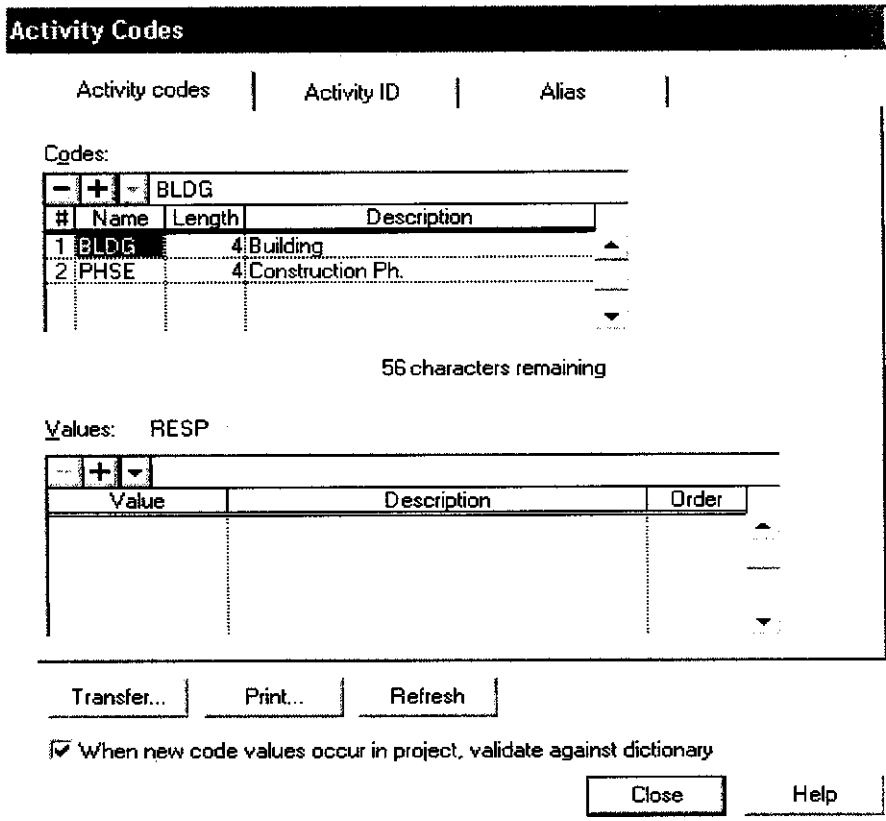
Click the "Organise" icon on the toolbar.

This window will appear:

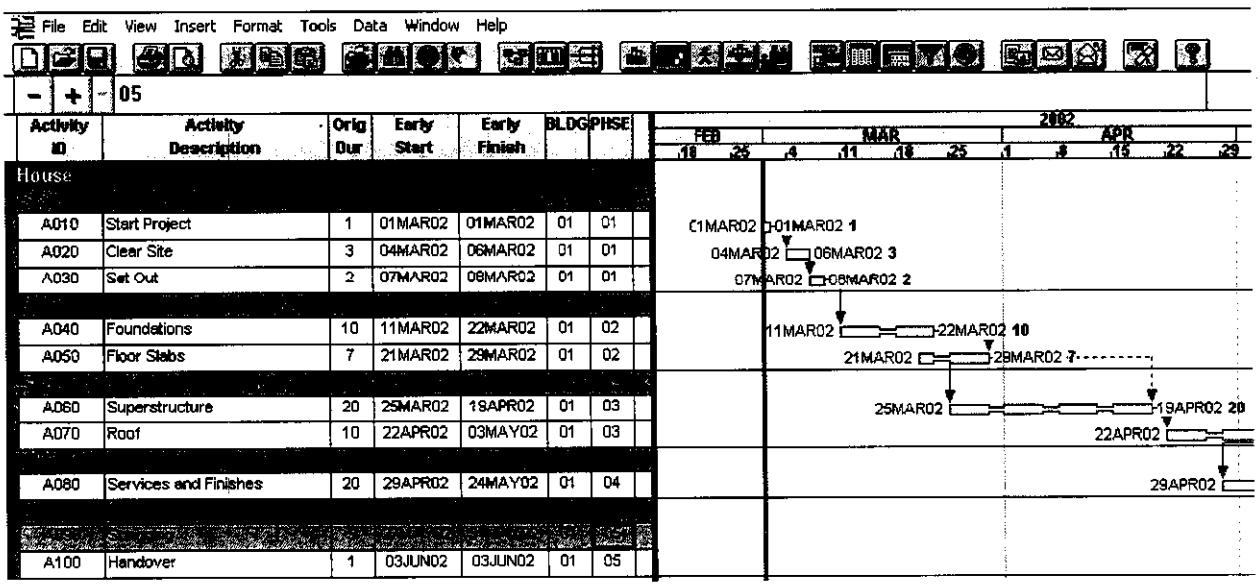


Organising By Activity Code :

The second method of organising activities in Primavera is by ActivityCode. Data – Activity Codes. This window will appear:



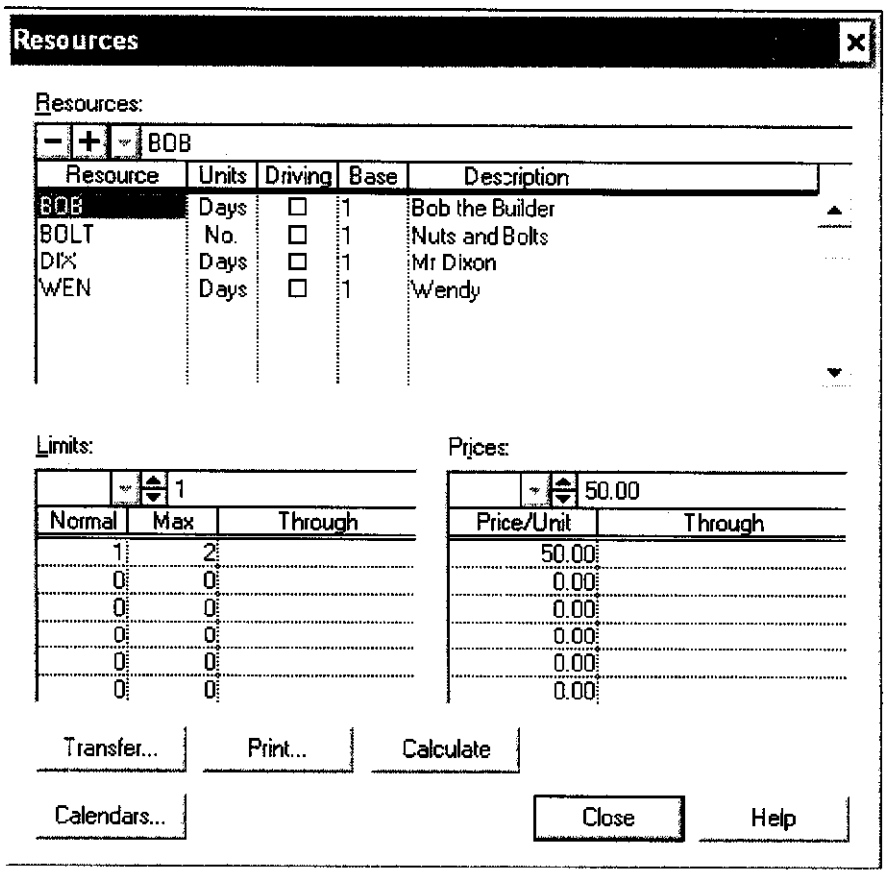
Press "Reorganise Now" and the schedule layout should change to this:



2.8.4 Resources

Primavera has the facility to receive resource data, apply costs to the resources, report these resources graphically, level the resources and apply actual expenditure against budgeted.

The first step is to establish a resource "dictionary" of the resources we wish to define for the project. Data > Resources opens the following window:



1. The resource "code"

2. The units that apply to this resource (e.g. m3, Hours, litres)

3. Whether the unit is "Driving" or not (i.e. whether the duration is driven by the resource quantity divided by the resource output)

4. The calendar to be used when this resource is applied.

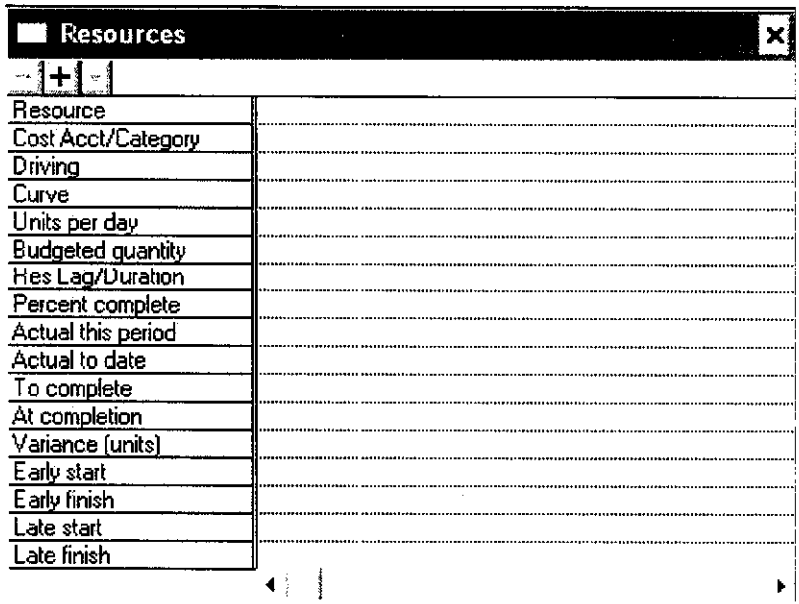
5. A description of the resource

6. Resource limits (used in resource levelling)

7. The cost, if required, per unit of the resource. The cost can reflect the monetary cost (if desired) or another aspect, such as

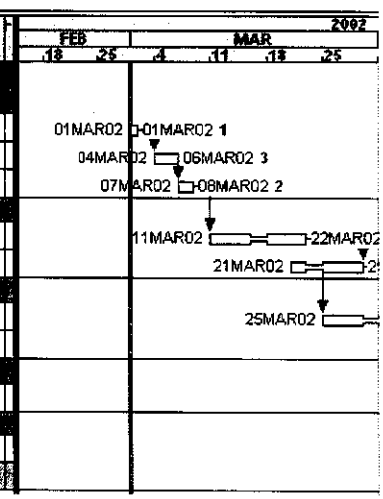
the number of man hours required to place a unit of the resource.

Once the resource data has been entered, close the window. Our next step is to apply these resources to our activities. Highlight the first activity – Start Project – and press Ctrl+R (or from the dropdown menu, View > Resource Detail). The following window will appear :



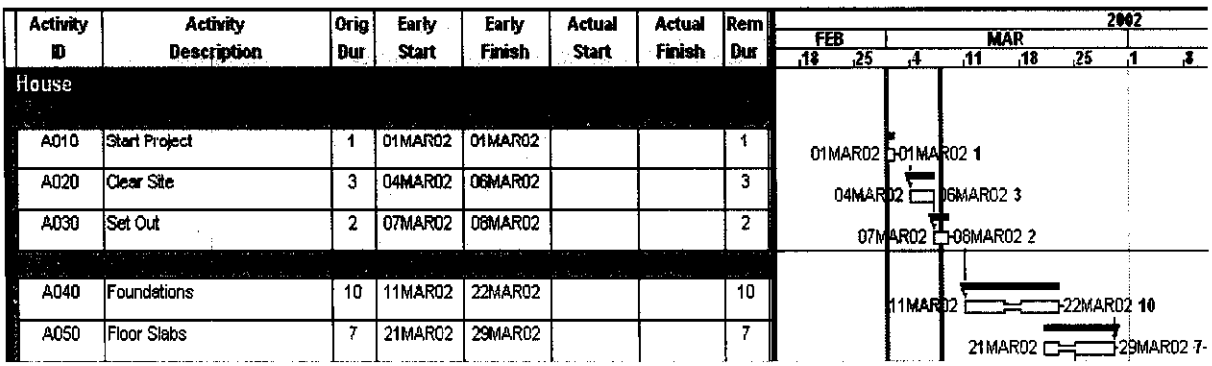
Close the Resource window and change two of the columns to show the resource assignments… the column titles will be "Resource" and "Budgeted Quantity":

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Resource ID	Budgeted Quantity
House						
A010	Start Project	1	01MAR02	01MAR02	BOB, BOLT	11.00
A020	Clear Site	3	04MAR02	06MAR02	DIX, BOLT	8.00
A030	Set Out	2	07MAR02	08MAR02	WEN, BOLT	22.00
A040	Foundations	10	11MAR02	22MAR02	WEN, BOLT	35.00
A050	Floor Slabs	7	21MAR02	29MAR02	BOB, BOLT	27.00
A060	Superstructure	20	25MAR02	19APR02	DIX, BOLT	35.00
A070	Roof	10	22APR02	03MAY02	DIX, BOLT	25.00
A080	Services and Finishes	20	29APR02	24MAY02	DIX, BOLT	40.00
A090	Snagging	5	27MAY02	31MAY02	WEN, BOLT	15.00
A100	Handover	1	03JUN02	03JUN02	BOB, BOLT	8.00

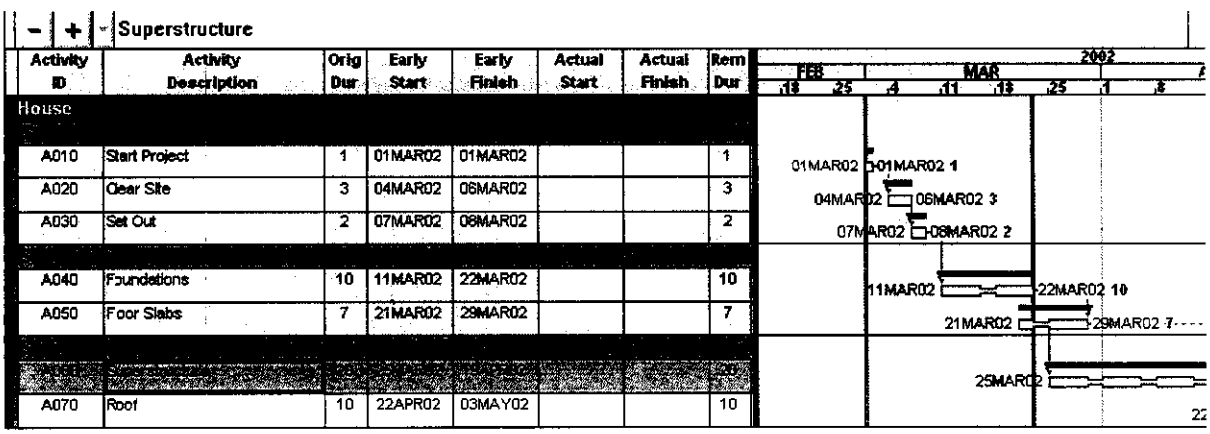


2.8.5 Reporting :

We are going to report progress up to the 23 March 2002. Primavera has a facility whereby you can highlight the activities that could be affected by progress up to a particular date. Press the Progress Spotlight - - button and the display will adjust to this:



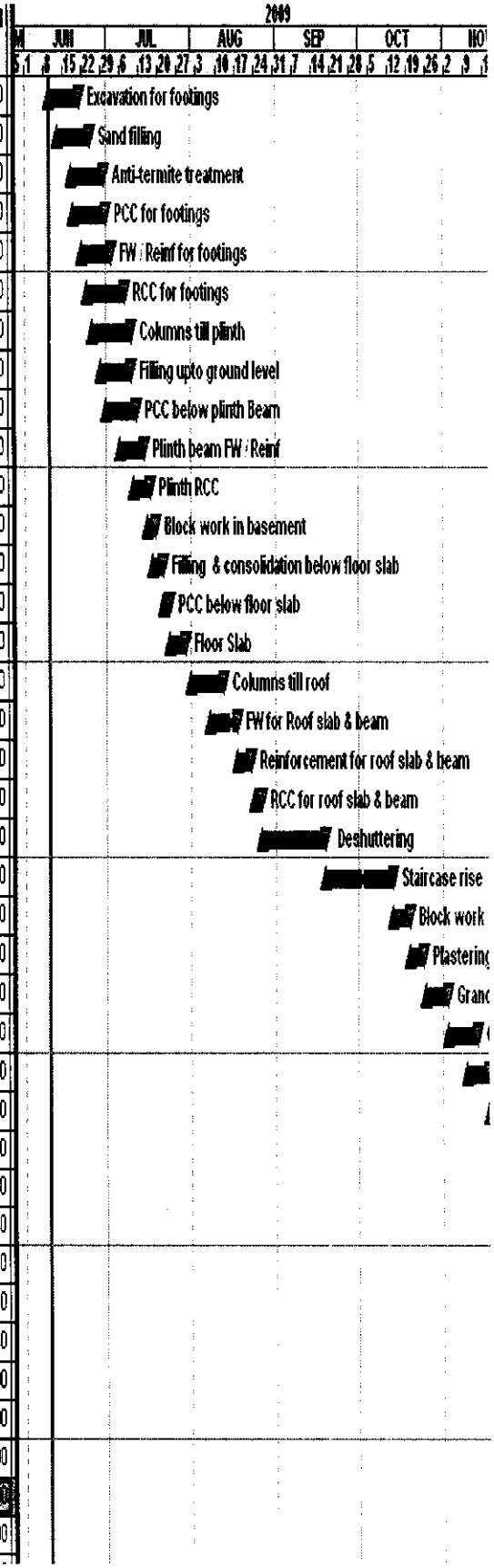
The progress spotlight, by default, highlights one week after the current Data Date. We need to adjust it to highlight the area we wish to progress. Move your cursor over the rightmost vertical blue line and the cursor will change to . Drag the vertical blue line to the 23 March 2002 and release. Your display should now look like this:



2.9 PRIMAVERA OUTPUTS

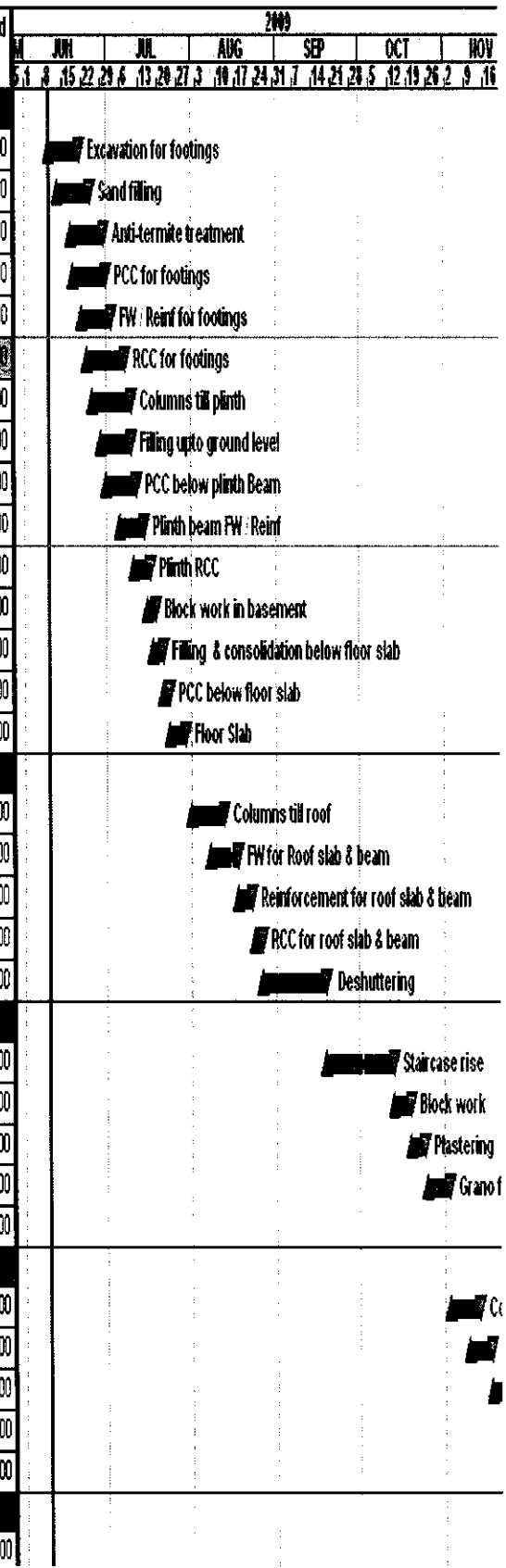
2.9.1 Activity Screen

Activity ID	Activity Description	Orig Dur	Rem Dur	%	Early Start	Early Finish	Resource	Budgeted Cost
GF01	Excavation for footings	10	10	0	10JUN09	20JUN09	SG, LC	190,000.00
GF02	Sand filling	10	10	0	13JUN09	24JUN09	LC	150,000.00
GF32	Anti-termite treatment	10	10	0	18JUN09	29JUN09	SG	40,000.00
GF42	PCC for footings	10	10	0	19JUN09	30JUN09	LC, CC	162,500.00
GF05	FW / Reinf for footings	10	10	0	22JUN09	02JUL09	CC, LC	162,500.00
GF06	RCC for footings	12	12	0	24JUN09	07JUL09	LC, CC	220,800.00
GF07	Columns till plinth	12	12	0	26JUN09	09JUL09	MC	144,000.00
GF08	Filling upto ground level	10	10	0	29JUN09	09JUL09	LC, SG	110,000.00
GF09	PCC below plinth Beam	10	10	0	01JUL09	11JUL09	LC, CC, MC	241,000.00
GF10	Plinth beam FW / Reinf	8	8	0	06JUL09	14JUL09	CC, LC	136,800.00
GF11	Plinth RCC	5	5	0	11JUL09	16JUL09	CC	8,500.00
GF12	Block work in basement	3	3	0	16JUL09	18JUL09	MC	36,000.00
GF13	Filling & consolidation below	3	3	0	18JUL09	21JUL09	LC	27,000.00
GF14	PCC below floor slab	2	2	0	22JUL09	23JUL09	CC, LC	15,400.00
GF15	Floor Slab	5	5	0	24JUL09	29JUL09	MC, LC	50,000.00
GF16	Columns till roof	10	10	0	01AUG09	12AUG09	RC, LC	135,000.00
GF17	FW for Roof slab & beam	7	7	0	08AUG09	17AUG09	MC, LC	70,000.00
GF18	Reinforcement for roof slab &	5	5	0	18AUG09	22AUG09	CC, MC, LC	67,750.00
GF19	RCC for roof slab & beam	3	3	0	24AUG09	26AUG09	CC, LC	20,550.00
GF20	Deshuttering	20	20	0	27AUG09	18SEP09	LC	240,000.00
GF21	Staircase rise	20	20	0	19SEP09	13OCT09	MC, LC	340,000.00
GF22	Block work	5	5	0	14OCT09	19OCT09	MC, LC	50,000.00
GF23	Plastering	5	5	0	20OCT09	24OCT09	LC, CC	38,500.00
GF24	Grano flooring	7	7	0	26OCT09	02NOV09	MC	28,000.00
FF01	Columns till roof	10	10	0	03NOV09	13NOV09	RC, LC, MC	210,000.00
FF02	FW for Roof slab & beam	7	7	0	10NOV09	17NOV09	CC, LC, MC	61,950.00
FF03	Reinforcement for roof slab &	5	5	0	18NOV09	23NOV09	CC, LC, MC	63,500.00
FF04	RCC for roof slab & beam	3	3	0	24NOV09	26NOV09	RC, LC, CC	29,100.00
FF05	Deshuttering	20	20	0	27NOV09	19DEC09	CA, LC	220,000.00
FF06	Staircase rise	20	20	0	21DEC09	12JAN10	LC, MC	340,000.00
FF07	Block work	15	15	0	13JAN10	29JAN10	MC, LC	255,000.00
FF08	Wall chasing for Electrical &	10	10	0	21JAN10	01FEB10	EC	100,000.00
FF09	conduiting & switch boad fixing	5	5	0	29JAN10	03FEB10	EC	50,000.00
FF10	wiring	3	3	0	04FEB10	06FEB10	EC	30,000.00
FF11	Plastering	20	20	0	08FEB10	02MAR10	LC, MC, CC	394,000.00
FF12	doors & windows fixing	20	20	0	08FEB10	02MAR10	CA	240,000.00
FF13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FF14	Floor tiling	20	20	0	09MAR10	31MAR10	MC, LC	100,000.00

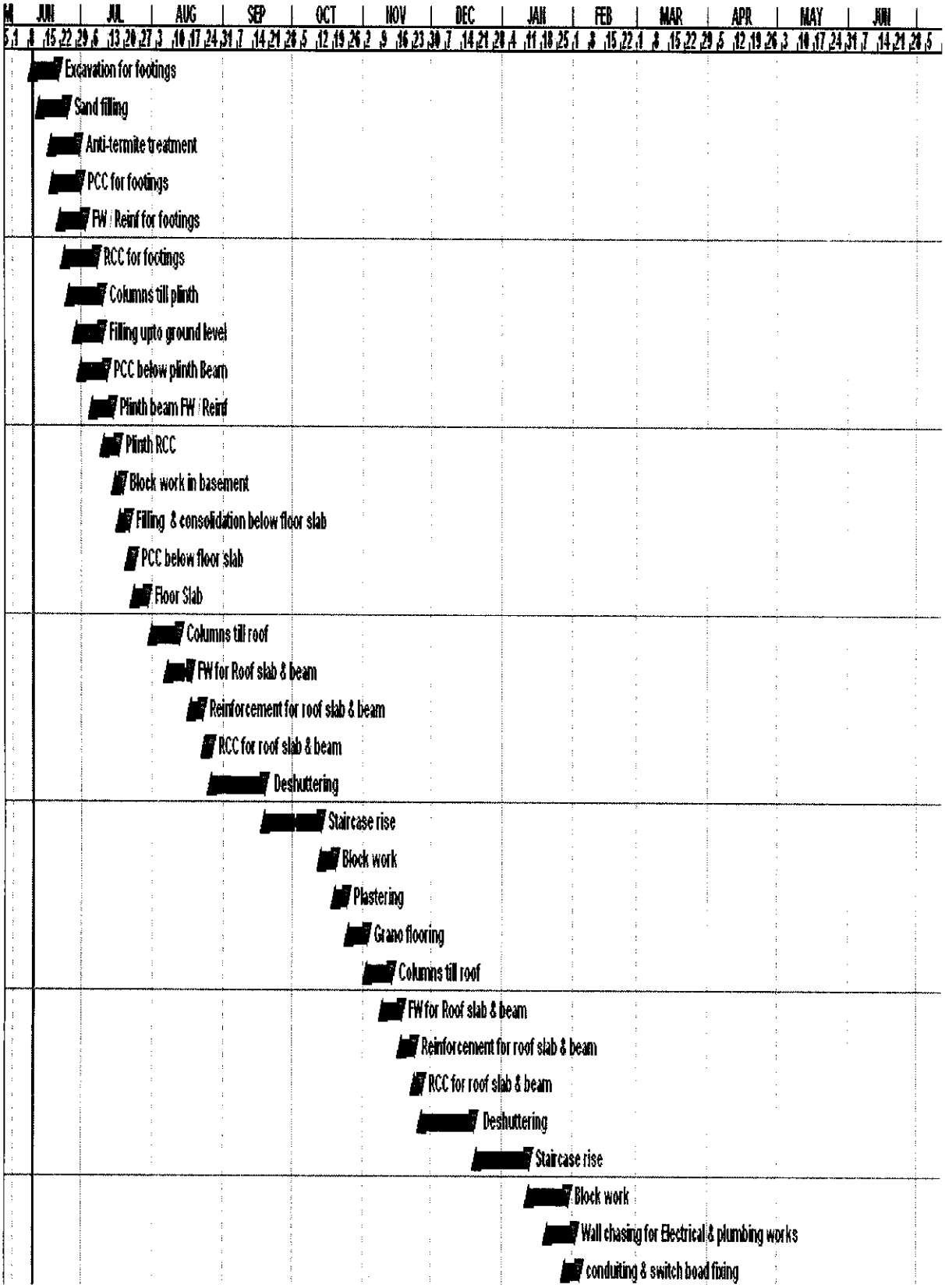


2.9.2 Organised Screen

Activity ID	Activity Description	Orig Dur	Rem Dur	%	Early Start	Early Finish	Resource	Budgeted Cost
FOUNDATION								
GF01	Excavation for footings	10	10	0	10JUN09	20JUN09	SG,LC	190,000.00
GF02	Sand filling	10	10	0	13JUN09	24JUN09	LC	150,000.00
GF32	Anti-termite treatment	10	10	0	18JUN09	29JUN09	SG	40,000.00
GF42	PCC for footings	10	10	0	19JUN09	30JUN09	LC,CC	162,500.00
GF05	FW / Reinf for footings	10	10	0	22JUN09	02JUL09	CC,LC	162,500.00
GF06	RCC for footings	10	10	0	23JUN09	03JUL09	CC,LC	220,000.00
GF07	Columns till plinth	12	12	0	26JUN09	09JUL09	MC	144,000.00
GF08	Filling upto ground level	10	10	0	29JUN09	09JUL09	LC,SG	110,000.00
GF09	PCC below plinth Beam	10	10	0	01JUL09	11JUL09	LC,CC,MC	241,000.00
GF10	Plinth beam FW / Reinf	8	8	0	06JUL09	14JUL09	CC,LC	136,800.00
GF11	Plinth RCC	5	5	0	11JUL09	16JUL09	CC	8,500.00
GF12	Block work in basement	3	3	0	16JUL09	18JUL09	MC	36,000.00
GF13	Filling & consolidation below	3	3	0	18JUL09	21JUL09	LC	27,000.00
GF14	PCC below floor slab	2	2	0	22JUL09	23JUL09	CC,LC	15,400.00
GF15	Floor Slab	5	5	0	24JUL09	29JUL09	MC,LC	50,000.00
STRUCTURE								
GF16	Columns till roof	10	10	0	01AUG09	12AUG09	RC,LC	135,000.00
GF17	FW for Roof slab & beam	7	7	0	08AUG09	17AUG09	MC,LC	70,000.00
GF18	Reinforcement for roof slab &	5	5	0	18AUG09	22AUG09	CC,MC,LC	67,750.00
GF19	RCC for roof slab & beam	3	3	0	24AUG09	26AUG09	CC,LC	20,550.00
GF20	Deshuttering	20	20	0	27AUG09	16SEP09	LC	240,000.00
INTERMEDIATE FLOOR								
GF21	Staircase rise	20	20	0	19SEP09	13OCT09	MC,LC	340,000.00
GF22	Block work	5	5	0	14OCT09	19OCT09	MC,LC	50,000.00
GF23	Plastering	5	5	0	20OCT09	24OCT09	LC,CC	38,500.00
GF24	Grano flooring	7	7	0	26OCT09	02NOV09	MC	28,000.00
FF14	Floor tiling	20	20	0	09MAR10	31MAR10	MC,LC	100,000.00
FIRST FLOOR								
FF01	Columns till roof	10	10	0	03NOV09	13NOV09	RC,LC,MC	210,000.00
FF02	FW for Roof slab & beam	7	7	0	10NOV09	17NOV09	CC,LC,MC	61,950.00
FF03	Reinforcement for roof slab &	5	5	0	18NOV09	23NOV09	CC,LC,MC	63,500.00
FF04	RCC for roof slab & beam	3	3	0	24NOV09	26NOV09	RC,LC,CC	29,100.00
FF05	Deshuttering	20	20	0	27NOV09	19DEC09	CA,LC	220,000.00
INTERMEDIATE FLOOR								
FF06	Staircase rise	20	20	0	21DEC09	12JAN10	LC,MC	340,000.00



2.9.3 Gantt Chart



2.9.4 Resource Loading Report

NPSS | PRIMAVERA PROJECT PLANNER | apartment building

REPORT DATE 20APR09 RUN NO. 16 | RESOURCE LOADING REPORT | START DATE 10JUN09 FIN DATE 22NOV11

20:52

DATA DATE 10JUN09 PAGE NO.

1-1

lc report | TOTAL USAGE FOR WEEK

ACT ID	DESC	TOTAL	8JUN 2009	15JUN 2009	22JUN 2009	29JUN 2009	6JUL 2009	13JUL 2009	20JUL 2009	27JUL 2009	3AUG 2009	10AUG 2009
FOUNDATION												
GF01	Excavation for footi	100	40	60								
GF02	Sand filling	100	10	60	30							
GF05	FW / Reinf for footi	80			48	32						
GF06	RCC for footings	120			40	60	20					
GF07	Columns till plinth											
GF08	Filling upto ground	60				36	24					
GF09	PCC belowplinth Bea	100				40	60					
GF10	Plinth beam FW / Rei	64					48	16				
GF11	Plinth RCC											
GF12	Block work in baseme											
GF13	Filling & consolidat	18						6	12			
GF14	PCC belowfloor slab	8							8			
GF15	Floor Slab	20							8	12		
GF32	Anti-termite treatme											
GF42	PCC for footings	80		16	48	16						
TOTAL	**FH**	**750**	**50**	**136**	**166**	**184**	**152**	**22**	**28**	**12**		
STILT LEVEL												
GF16	Columns till roof	40								4	24	12
GF17	FW for Roof slab & b	28									4	20
GF18	Reinforcement for ro	30										
GF19	RCC for roof slab &	12										
GF20	Deshuttering	160										
TOTAL	**SL**	**270**								**4**	**28**	**32**
INTERNALFINISHES- CAR PARK												
FF14	Floor tiling	40										
GF21	Staircase rise	120										
GF22	Block work	20										
GF23	Plastering	20										
GF24	Grano flooring											
TOTAL	**IC**	**200**										
FIRST FLOOR												

2.9.5 Cost Loading Report

NPSS | PRIMAVERA PROJECT PLANNER | apartment building

REPORT DATE 20APR09 RUN NO. 17 | COST LOADING REPORT | START DATE 10JUN09 FIN DATE 22NOV11

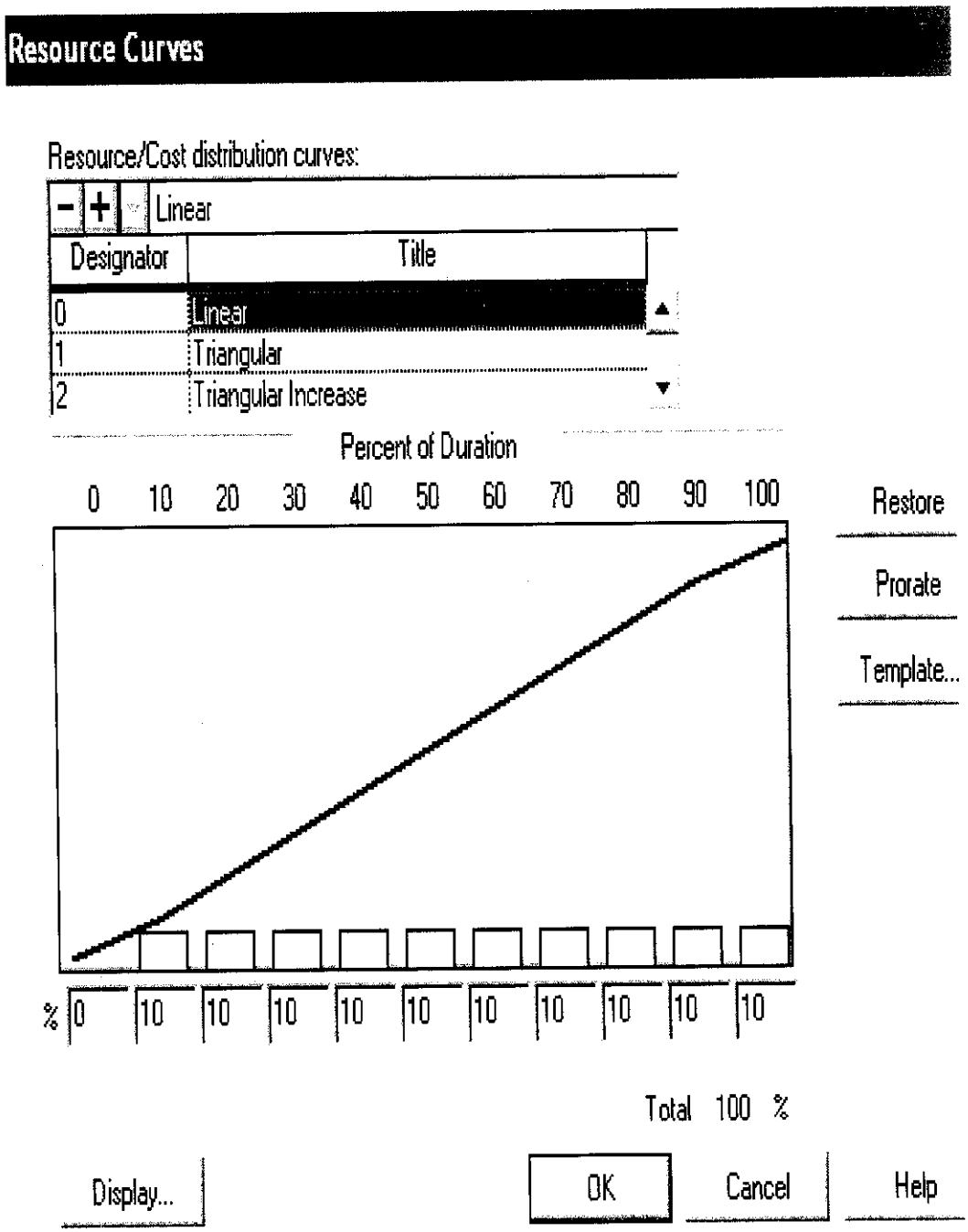
21:45 | DATA DATE 10JUN09 PAGE NO. 1-1

concrete crew cost report | TOTAL USAGE FOR WEEK

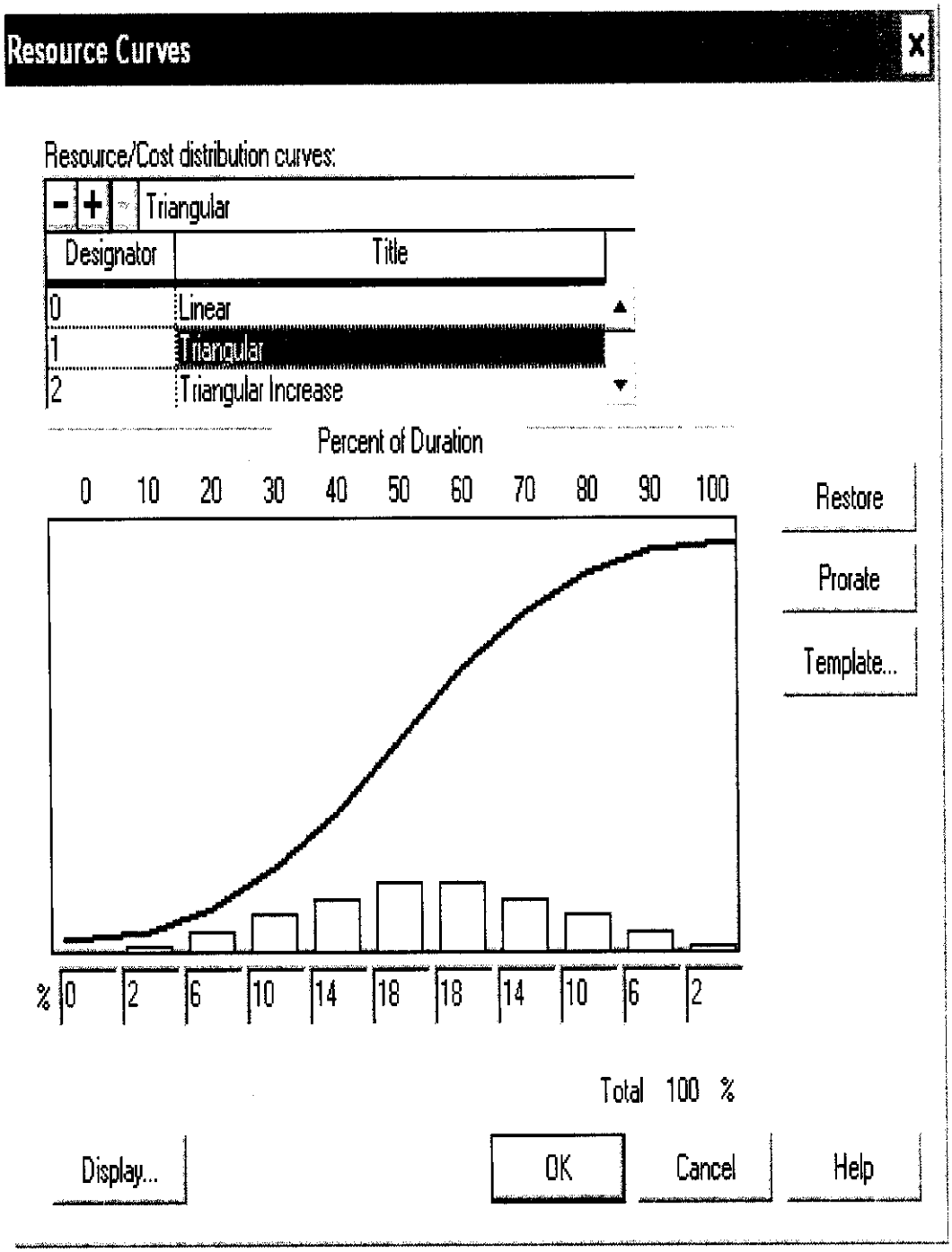
ACT ID	DESC	TOTAL	8JUN 2009	15JUN 2009	22JUN 2009	29JUN 2009	6JUL 2009	13JUL 2009	20JUL 2009	27JUL 2009	3AUG 2009	10AUG 2009
FOUNDATION												
GF01	Excavation for footi											
GF02	Sand filling											
GF05	FW / Reinf for footi	42500			25500	17000						
GF06	RCC for footings	40800			13600	20400	6800					
GF07	Columns till plinth											
GF08	Filling upto ground											
GF09	PCC belowplinth Bea	51000				20400	30600					
GF10	Plinth beam FW / Rei	40800					30600	10200				
GF11	Plinth RCC	8500					1700	6800				
GF12	Block work in baseme											
GF13	Filling & consolidat											
GF14	PCC belowfloor slab	3400							3400			
GF15	Floor Slab											
GF32	Anti-termite treatme											
GF42	PCC for footings	42500		8500	25500	8500						
TOTAL	**FH**	**22950**		**8500**	**64600**	**66300**	**69700**	**17000**	**3400**			
STILT LEVEL												
GF16	Columns till roof											
GF17	FW for Roof slab & b											
GF18	Reinforcement for ro	12750										
GF19	RCC for roof slab &	2550										
GF20	Deshuttering											
TOTAL	**SL**	**15300**										
INTERNALFINISHES- CAR PARK												
FF14	Floor tiling											
GF21	Staircase rise											
GF22	Block work											
GF23	Plastering	8500										
GF24	Grano flooring											
TOTAL	**IC**	**8500**										

2.9.6 Resource/Cost Distribution Curve

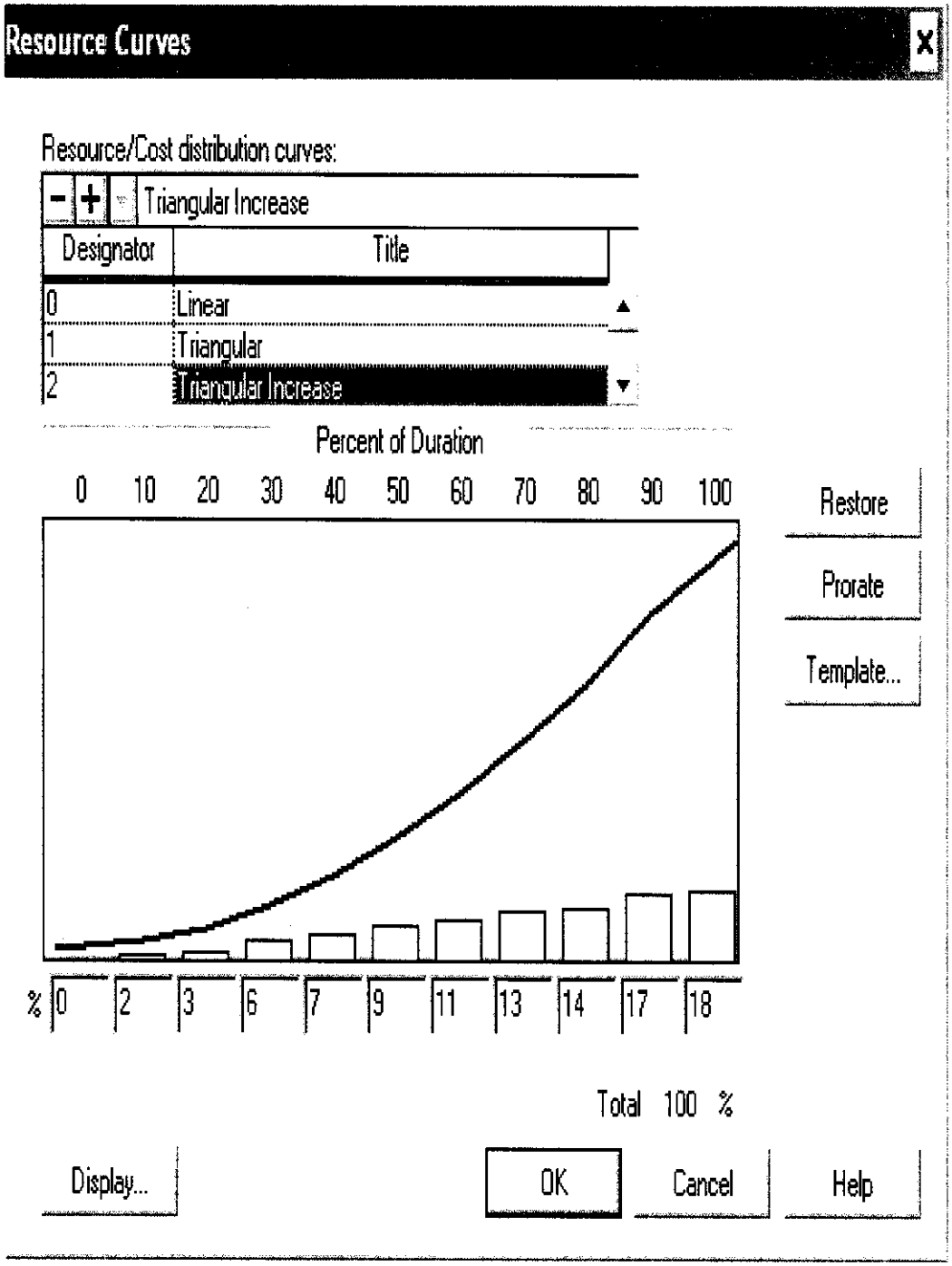
2.9.6.1 Linear Curve



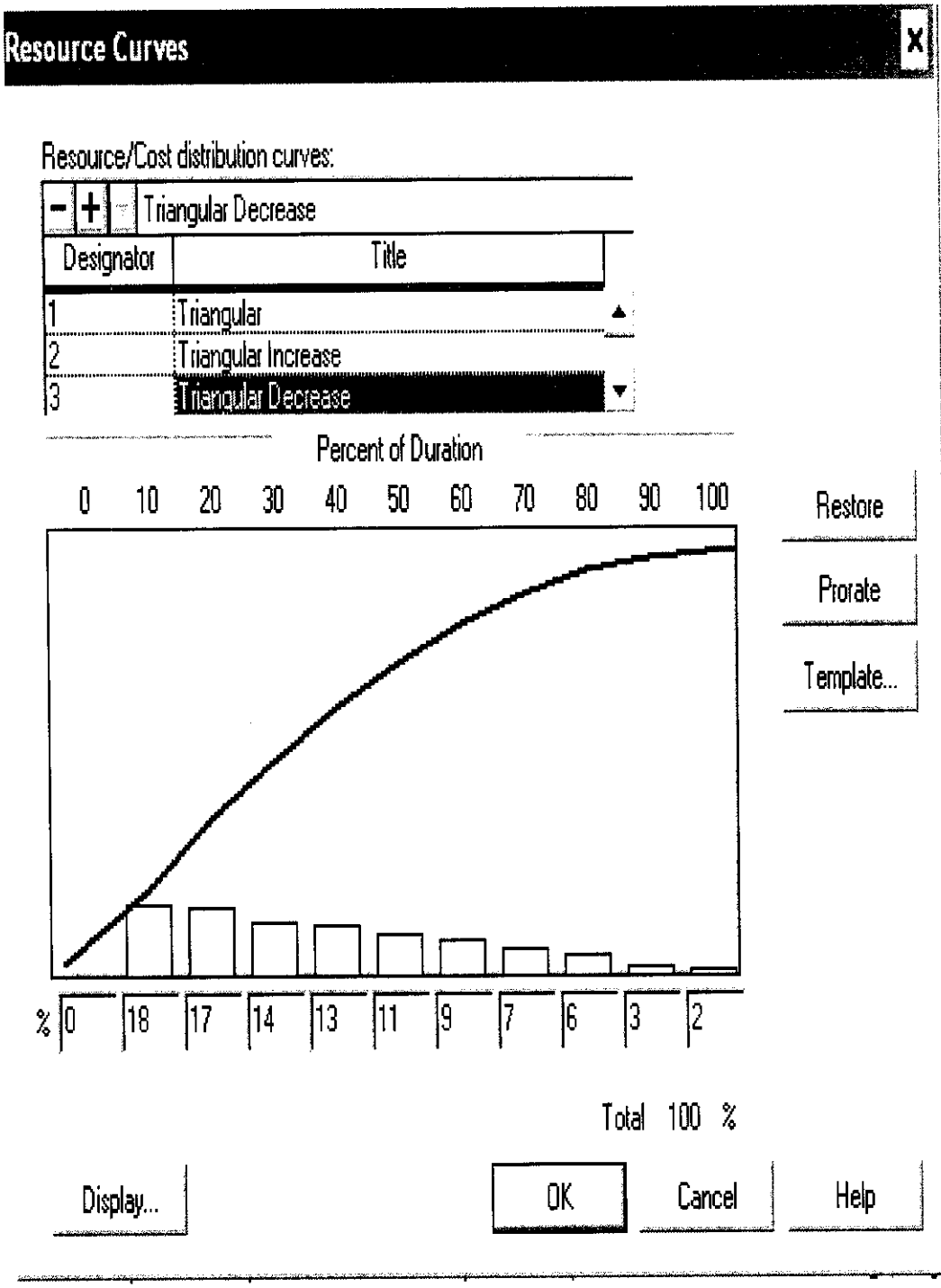
2.9.6.2 Triangular curve



2.9.6.3 Triangular Increase



2.9.6.4 Triangular Decrease



3. CONCLUSION

The construction planning and scheduling of various activities of the port has been successfully done using MSProject and the reports are presented in this project.

The estimated duration and cost of the proposed port has been worked out as 425 days and 4 billion respectively.

The construction planning and scheduling of various activities of the multistoried building has been successfully done using Primavera and the reports are presented in this project.

The estimated duration and cost of the proposed multistoried building has been worked out as 2 yrs 5 months and 75 lakhs respectively.

MS Project and Primavera can be used effectively in the preparation of construction scheduling of civil engineering structures.

The time required for the preparation of the schedule using these software is much lesser than the preparation done manually.

So the software are a time saving and the output obtained is very accurate.

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