COMPUTER APPLICATION IN ENGINEERING PROJECT MANAGEMENT

A CASE STUDY OF THE AFRICAN DEVELOPMENT FUND ASSISTED SOKOTO HEALTH SERVICES REHABILITATION PROJECT

BY

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DEDICATION

I dedicate this work to my wife Mrs. Stella Onyeiwu for her support and encouragement all through the period of the MBA programme.

CERTIFICATION

This Project, Computer Application in Engineering Project Management: A case study of the African Development Fund Assisted Sokoto Health Services Rehabilitation Project meets the regulations governing the award of the degree of Master of Business Administration (MBA) of the Ahmadu Bello University Zaria and is approved for its contribution to knowledge and literary presentation.

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ABSTRACT

Computer Application to Engineering Project Management aims at using computers to effectively carry out the project management objectives of planning, directing and controlling project from its inception to its completion within a given time and cost frame.

This study applied computer methods using the Microsoft Project Version 3 as the project management software for the project planning of the Sokoto Health Services Rehabilitation Project. The study aimed at comparing the computer method with the manual method with a view to determining the most efficient and cost effective method of Project Management.

The result of the study indicated that the computer method gave a better control of the project execution process and produced an over 40% savings on resource cost when compared to the manual method. The computer method was found to generate better graphics and therefore better communication medium. It was also more responsive to detection of variation in plans and predicting performance of different possible scenarios.

The computer method was able to generate cost associated with each task and total cost associated with the use of each resource element. The Gantt and PERT Charts generated by the computer systems automatically indicated the critical paths within the project.

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1.0 INTRODUCTION

Following the approval of the African Development Fund Board for funding assistance for the rehabilitation of 11 Nos general hospitals in Sokoto State, the Project Implementation Unit (PIU) requested proposals from suitably qualified multi-disciplinary consultants for the proper planning and management of the rehabilitation works. As a senior professional working with one of the firms requested to present proposals, it was thought that a computer application to the planning and project management of the rehabilitation work should be put forward. Owing to lack of adequate facilities and expertise, this concept was dropped for a manual approach which is what most members of the team are used to. Not wanting to be deterred by these limitations, I decided to research into this field of study with the hope that it will provide an opportunity for indept studies into the use of computers in Project Management and also begin the process of producing professional project managers vast in the use of computers for project management.

1.1 Project Management Defined

Project Management could be defined as the process of planning and directing a project from its inception to its completion in a given time at a given cost for a given end product. It entails the cycle of planning, directing, detecting changes in the project environment and providing feedback for replanning.

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Project Management concerns getting things done-by making things happen. It involves determining what is to be done, how, when, where, by whom and at what cost. It is fundamentally about risk. Every project has risk associated with it, so project management involves spotting the risks and acting to reduce them. A managed project is one where events are not simply left to chance. Instead, they are planned, organised and arranged into sequences with anticipated durations, costs and consequences.

Things are rarely accomplished by mere chance: getting them done requires planning, pushing things in the direction of the plan, setting deadline dates, and checking that the steps along the way are on track. Thus Project Management activities create challenges that demand the creation, processing and evaluation of large amount of information to achieve objectives. In addition they confront the Project Managers with the responsibility of completing a project within budget and schedule that are in constant flux or affected by numerous variables. These variables include unpredictable increase in the cost of labour, material and services. Managing all these uncertainties need a highly organised person and the aid of the computer is therefore of tremendous assistance.

Project Management as a field of study emerged in the early 1970s although the practice of its basic form had been in use as early as 1950 on large defence projects in the USA. The need for it arose as a result of the lack of technically competent facilitators to bridge the technical communication gap that always existed in project execution amongst the client, the consultant and the contractor. Thus the need for a technically sound and experienced professional whom the client can rely upon to

1.21 Planning

First, a project definition is needed. Then what the project is supposed to accomplish? Once there is a general consensus on what the project is supposed to achieve, the next step is to establish what is involved. This is traditionally done by developing a work breakdown structure (WBS). A WBS is a list, of all the chunk of work involved in the project. It is important to note that a WBS could be weak. This is especially so if its production has been done by people with insufficient relevant knowledge of the work items. It is therefore necessary to use the expert to do the WBS. In general, the WBS need not be too detailed. It needs first enough details to allow for a clear downward delegation of tasks and clear upwards communication of progress against the tasks. On completion of the WBS, resources in terms of time and cost are assigned to each task within the WBS. Other methods of planning include the Organisation Breakdown Structure (OBS) and the Resource Breakdown Structure (RBS).

1.22 Communicating

Project Management Communication is usually associated with a Gantt Chart, a scheduling tool showing a timescale along the horizontal axis, and the project's work breakdown structure along the vertical. A horizontal bar represents the duration of each task, and the ends of a Gantt bar correspond to the tasks start and end dates. It is also a good communication tool, showing clearly what is to happen when. With most project management softwares, the Gantt Chart also includes a "spreadsheet" view alongside the WBS, listing additional information such as resource person's name and actual hours to be worked.

1.22 **Controlling**

Controlling the project is the hardest part. Tools (softwares) help, although this is the part of project management in which books and softwares are of least use. Project control consists of three main things: updating the project plan with actual progress, tracking resources consumed (including man hours) and thus costs, and taking corrective action where there is a significant discrepancy between planned and actual state of affairs. Here the two stages - planning and communicating - come into play again which are both necessary for understanding the potential impact of variances and for communicating recommendations to others.

The above are the main aspects of basic project management. Other aspects include more sophisticated technics such as PERT (Programme Evaluation and Review Technique) analysis, Critical Path calculation and formal risk management systems.

1.24 **Tools**

Picking the right tool is important. In a big project, a significant proportion of project time could be spent using the project management system. The appropriate tools should be one with which the manager is comfortable and which accomplishes the reports needed quickly and easily. If the tools are inadequately used, it amounts to wasted money and time. In computer application to project management, the basic tools used are the softwares.

Project management systems can offer many detailed features, not all of which will be of direct use. Many people use project management tools a little more than graphics packages to generate Gantt Charts, and care little for automatic critical path analysis and resource levelling. In selecting the project management tool, the following features should be looked for:

- The package should be easy to use or it will probably not be used.
- It should be founded on sound techniques, which can be learnt.
- Project tracking should be well supported to enable effective project control.
- Built-in graphics and effective reporting tools are vital, otherwise hours will be wasted transferring data to other packages to enable project communication.
- The supplier should be able to provide effective and timely telephone support.

Some of the most popular tools (softwares) used in computer application to project management include:

(1) The Tekware Project Scheduler 6 (PS6)

(2) The Microsoft Project 4.0

(3) The Harvard Project Manager

(4) The Primervera Project Planner

The PS6 is an attractive and usable project management tool encompassing quick-start features to get you up and running alongside powerful data management capabilities normally found only in topend packages. This makes it a high - value product, which should be on every project managers shortlist at software purchase time.

The primary data view, as in most project management software, is the Gantt Chart. Alternative views are provided, including PERT charts and task breakdown images, which can be either work breakdown structures or organisation breakdown structures. Multiple project management is handled well, with shared resource information held in a common resource pool. The package also includes Advanced Resource Tracking Spreadsheet technology, which provides a spreadsheet-like view of data, a familiar and useful view. This enables project update data, or actuals to be entered regularly and compared with baseline estimates easily, on a time - period basis. A reporting tool is built in, which enables selective WBS, OBS or RBS outlines. Financial reporting is of very high quality, with many financial reports ready packaged, such as costs by resources, cumulative project costs, and costs by resources and tasks. Extensive graphing options mean that most reports can be presented graphically too.

Unlimited capacity to do and re-do features lets the manager try any scenarios, and backtrack to former position if the resulting thing seems unworkable. In summary the PS6 is an effective and appealing piece of software.

Microsoft Project 4.0

This is a popular software from the stable of Microsoft. The design of this software is familiar, comfortable and user friendly. The version 4 is a vastly improved product which threatens some of the established big-guns in the industry.

Planning Wizards, the microsoft projects version of the ready-to-run routines built into the package, can automate significant parts of the project planning and

communicating process. The tutor and project guides take you through the process of setting up one's first project - with one's own data. Once any plan is created, it can be saved and recalled as a template and template wizards are on hand to help.

Calendar views are simple to create and understand, and arrow links have been added to the Gantt Chart views to show task links more clearly. Free text and graphical objects can be added to Gantt charts. Workgroup integration is well supported.

Project 4.0 is a serious and powerful project management tool which is doing very well. The close integration with the rest of the Microsoft desktop makes it the most popular and easier to use project management software and the strength of Microsoft implies a well supported product which will be bolstered by an array of third party add-ons. This package will be used for the works on this study.

Hardwares

The hardwares required for effective application of computers in project management is the basic desktop personal computer. To effectively run the software listed above, an AT (Advance Technology) based machine is basic. Usually the 286, 386, 486 or the Pentium systems will suffice. However the later versions of most recommended softwares will only run on a 386 PC or high grades.

Thus a 486 system with a minimum of 4MB RAM and 250MB Hard Disk is recommended. Other peripherials expected to complement the system are a laser printer and possibly a table plotter.

1.3 STATEMENT OF THE PROBLEM

Great challenges are at the doorstep of project managers in Nigeria. All over the country, there are projects that are abandoned, or have failed to meet the objectives for which they were embarked upon. The common feature of all projects is that they involve significant commitments of scarce economic resources in the expectation of reaping some benefits during and/or at the end of the project.

Accordingly, a project would be considered a success, in so far as its implementation is concerned, if it satisfies the following criteria.

- It is completed on schedule
- It is completed within the originally estimated cost.
- It is satisfactorily delivering the product.
- It meets the service for which it was planned.

As per these criteria, only a handful of public sector projects in Nigeria could be unequivocally described as unqualified success. Examples abound of aborted projects, abandoned projects and outright project failures (in the sense of not fulfilling the originally intended development objectives). In the agricultural sector for instance, the Green Revolution Programme, Operation Feed the Nation and the Accelerated Food Production Programmes stand out as failures that did not achieve their original objectives.

The Universal Primary Education Scheme would qualify as an abandoned project in the educational sector. The engineering and infrastructural sectors present a much wider list of problem projects. Among the best known of these are:

(a) The Ajaokuta Steel Complex which was begun in the late 1970s with a view towards commissioning in 1985. Current expectations are that it will not fully become operational until the year 2000.

(b) The Iwopin Paper Mill in Ogun State which was abandoned in the early 1980s and is estimated to require in excess of another ₦2 billion to resuscitate and complete.

(c) The aerostat balloon projects initiated in 1975 to facilitate multi-channel television and radio broadcasting and to improve interstate telephone communication. By the time it was ultimately abandoned in 1984, it had gulped over ₦140 million in pre SAP funds.

(d) The Lagos Metroline Project which was expected to move 2.3 million passengers daily and had been projected to cost ₦700 million. It was finally abandoned in 1984 after ₦75 million pre SAP funds had been spent.

(e) The Lagos State refuse compositing and incinerating plants which had cost over ₦40 million and are yet to become operational.

While financial constraints are often cited as the culprits for this graveyard of aborted and abandoned projects, closer examination would ultimately point to a flaw in one aspect or another of Project Planning and Management. This includes but not necessarily limited to ill-conceived and ill-planned projects, deliberate or inadvertent cost under-estimation, unrealistic project scheduling, ineffective monitoring mechanisms, governmental bureaucracy, red-tapism interference, and undue proliferation of development projects far beyond the human and financial resource capacity of the executing agencies and the nation at large.

Table 1.1 depicts the record of public project completion (or lack thereof) in a selection of states. As unscientific and non comprehensive as the sample may be, it nevertheless illustrates the gross wastage of resources arising from aborted, abandoned and non-operational projects. Studies carried out by Basil U.N. Igwe (1991) show that for economic projects, completed and operational projects represent only 31%. In the social sector only 22% of the projects were completed and operational whereas abandonments during implementation represent nearly 50% of the sample.

Interestingly, the record of successful implementation is far more impressive in the private sector. This must reflect the care and professionalism exercised during project planning, with a view to minimizing surprises during actual implementation and operation. Such problems as failure to organise the necessary project financing, inefficient project Planning and management, and undue interference in the routine execution of projects are usually the exception rather than the norm in the private sector projects.

It is against this background of poor project performance in the public sector that it is considered necessary to try out the use of a less emotional more organised approach to project planning, monitoring and control in public sector projects with a view to reducing the incidence of failed projects and improve on the success rate of public sector project. It is hoped that the introduction of computer application will make the work of project managers working within the complex network of changing resources, rules and controls easier to manage.

TABLE 1.1 RECORD OF PROJECT ABORTIONS, ABANDONMENTS AND COMPLETIONS IN SELECTED STATES

STATE	ECONOMIC PROJECTS					SOCIAL PROJECTS					TOTAL
	ABORTED	ABANDONED MID-STREAM	COMPLETED-AND COMPLETION	ABANDONED AFTER COMPLETION	SUB-TOTAL	ABORTED	ABANDONED MID-STREAM	COMPLETED AND OPERATIONAL	ABANDONED AFTER COMPLETION	SUB-TOTAL	GRAND TOTAL
ANAMBRA (1981-1988)	103	43	97	5	248	57	80	27	4	168	416
BAUCHI (1981-1985)	4	48	32	-	84	NOT AVAILABLE					84
BENDEL	69	19	50	17	155	NOT AVAILABLE					155
BENUE (1976-1986)	39	79	16	-	134	33	44	10	2	89	223
BORNO (1976-1986)	21	7	19	-	47	4	3	28	-	35	82
GONGOLA	69	19	50	17	155	NOT AVAILABLE					155
KWARA	39	29	82	10	160	15	47	59	7	128	288
NIGER	16	148	9	-	173	-	55	6	-	61	234
OGUN	2	28	75	7	112	7	28	16	34	85	197
ONDO (1981-1986)	31	104	11	1	147	36	95	11	2	144	281
RIVERS (1975-1990)	38	58	42	2	140	21	43	24	-	88	228
TOTAL	431	582	483	59	1,555	173	395	181	49	798	2,353

Source: Compiled by the National Centre for Economic Management and Administration, (NCEMA), 1990

OBJECTIVE OF THE STUDY

The overall goal of this project is to develop a simple method of applying computer methods to engineering project management of public sector projects using the African Development Fund assisted Sokoto Health Project as a case study. In order to achieve this goal, the following objectives were set.

(1) To plan projects so that the objectives in terms of time and cost can be evaluated.

(2) To control projects so that as soon as the actual performance begins to differ from the plan, the system will immediately indicate variation and remedial action can be taken if necessary.

(3) To provide an effective means of communication between the various departments and companies involved in a project.

(4) To provide a discipline to the organisation by setting down explicit method of working and lines of communication in a work structure form.

(5) To improve the quality of estimation and implementation of public sector projects in general.

SIGNIFICANCE OF THE STUDY

The study will assist in evolving an effective method of project management for public sector project.

LIMITATIONS

The study will be limited to the development of methodology and computer methods for a complete work plan based on the Terms of Reference (TOR) for the project. The Terms of Reference will be limited in this study to the procurement of multi-disciplinary consultant for overall management of the project. Also resource analysis and cost determination for the services will be presented in the form of a financial proposal.

CHAPTER 2

REVIEW OF LITERATURES

2.0 DEFINITIONS

Larry A. Smith, (1980) Florida International University defined Project Management as a set of techniques, procedures, and methods for systematically planning, organising, monitoring and controlling cost, time and specifications of a project. He further emphasises that the components of this approach also include processes for organising project teams, managing conflict and developing organisational structures and computerised systems to assist in implementing the quantitative techniques.

Basil U. N. Igwe, (1991) in his paper "stages of Project Planning and Management Cycle defined Project Management as the process of planning and directing a project from its inception to its completion in a given time, at a given cost and for a given end product. Thus it entails the cycle of planning, direction of work according to plan, monitoring achievements, detecting changes in the project environment, and providing feedback for replanning.

Glen Peters, (1984) in "Construction Project Management using small computers" declared that Project Management is essentially about managing a project from an idea through to completion

The Institute of Quantity Surveyors (IQS) Research Committee 1976, defined "Project Management as the function of planning, managing and controlling a

construction project on behalf of a client in order to achieve a completed project which satisfies the client in terms of his own needs, within the constraints imposed upon the client and the project by society and the maintenance of the utility of the project throughout its life"

Project management, as we know it today, first emerged in the early 1950s on large defence projects. Gradually smaller organisations adapted the idea and currently the smallest construction firms are known to operate project management in some form.

2.1 Stages of Project Management

Glen Peters, (1984) in "Construction Project Management using small computers" states that in discussing the stages of Project Management, an understanding of the stages of a project is important. A project is a dynamic ever changing system. Its status changes from that of an idea or concept, through to feasibility studies, execution and finally completion.

The generally accepted stages in project management are:

(1) The idea stage

(2) The feasibility stage

(3) The execution stage

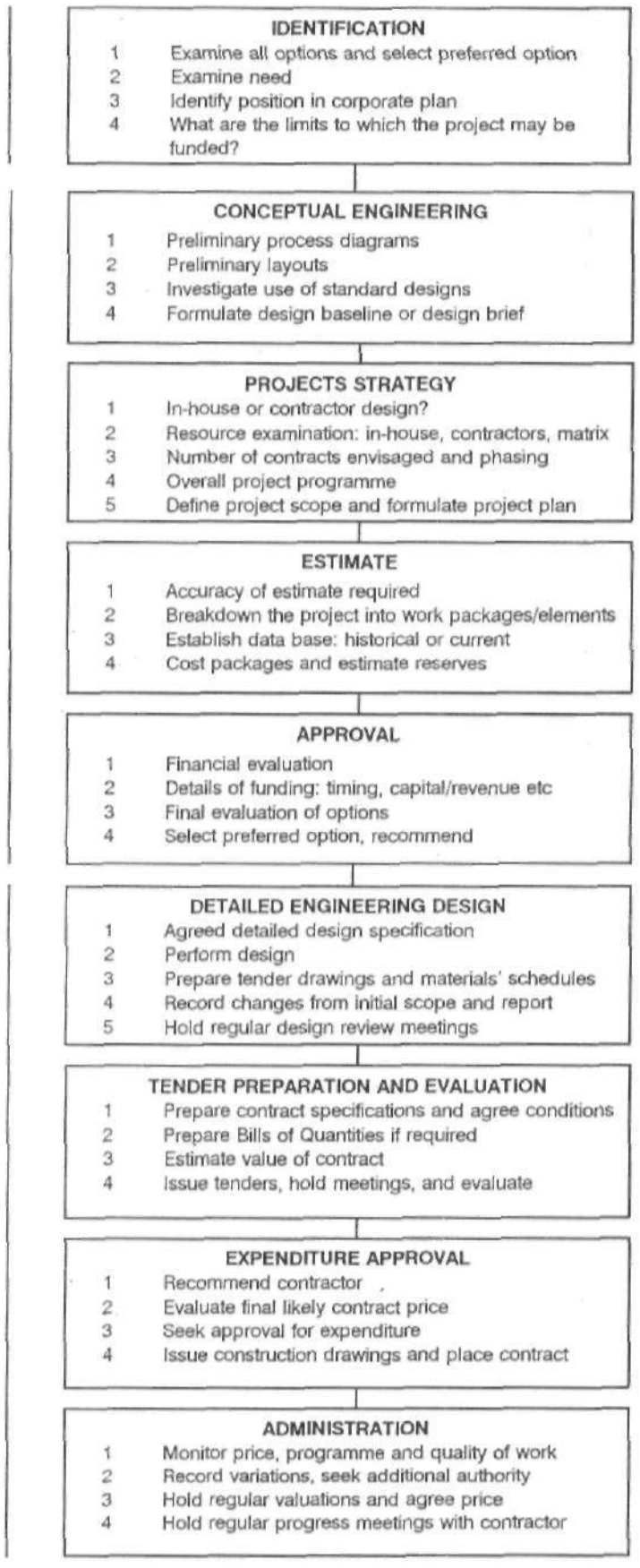
(4) The completion and commissioning stage.

Fig. 21.



A detailed layout of some of the activities during each of the four stages is shown in fig. 2.2.

Fig. 2:2 Stages in Project Management



(viii) Export prospects.

Identification studies are generally sketchy in nature and tend to rely on aggregate estimates rather than detailed analysis. Their purpose is merely to scan the economic, socio-political, financial and physical environment in which the project is to be situated.

The Feasibility Stage

The purpose of a feasibility study is to provide the technical, economic, commercial and financial base for an investment decision. The analysis is specific in the sense that it focuses on a project of a defined capacity at a selected location, using a particular technology in relation to defined materials and inputs. A good feasibility analysis should be interactive in character, involving a cycle of feedback and interlinkages covering possible alternative solutions for production programmes, locations, sites, technologies, engineering and organisational set up. The purpose is to minimise investment and production costs. A feasibility study is not a justification study. A feasibility study should give definite yes or no answers - "yes", serving as a basis for confidence in the viability of the project, and "no" serving to re-channel scarce resources from unviable to viable projects. Once the feasibility study is reviewed or appraised by the approving authority and recommended, the project then goes into the execution stage.

Execution and Completion Stages

Under this stage, detailed designs are carried out by various professionals engaged for these services. At the end, a final design would have been agreed upon by

the project team and the preparation of tender documents must commence.

A multi-million naira project can generate hundreds of drawing from different disciplines all in different stages of approval. The task of ensuring that every scrap of information, down to the last detail, ties up with the overall design is a mammoth one. Tenders must be issued for contract work and then evaluated. The preparation of clear, precise documents is imperative to eliminate any disputes on scope of work at the contract stage. After evaluation, recommendations must be made for the successful contractor and approval sought to place a contract. When the contract has been awarded, progress of work will be closely monitored and regular client - contractor meetings held to assess costs and the progress of the programme.
On completion, work must be approved, the installation commissioned and handed over to the user.

2.2 The Role of the Project Manager

Glen Peters, (1984) in his book "construction Project Management using small computers" submits that the Project Manager should be appointed at the feasibility stage and should take control of the project as soon as possible. The staffing of his team will depend on the structure adopted, the size of the project and the level of activity at any particular stage. The Project Manager should be responsible for:

(1) Co-ordinating all project activity.

(2) Making project recommendations.

(3) Fixing a design and preparing all drawings and specifications for tender and construction.

(4) Preparing all estimates; and

(5) Administrating all contracts and issuing all certification.

Engr. Basil Igwe, (1991) in his paper "Stages of project planning and management cycle" suggests that the Project Manager is at the apex of the implementation hierarchy. His role has been likened to that of a physician who "must be an expert diagnostician, who must guard his project from infection, detect symptoms, diagnose causes, and prescribe cures for a multitude of afflictions. Preventive measures and early treatment are acknowledged to be the key safeguards"

The complexity of the Project Managers mandate and the diversity of relationships which he must nurture are as illustrated in figure 2.3. Shown also are the inputs expected of these various parties. From the nature of his mandate, the Project Manager should:

- Know the project and understand its objectives.
- Be appointed when the project is first conceived.
- Be given the responsibility and authority to manage the project.
- Know the systematic processes for managing projects.
- Know how to get the project to reach its desired objectives through people.

2.3 The Use of Computers

Computers have been used in managing projects when:

(1) Projects are large with several resources required in their execution.

(2) Projects have high level of sophistication, where complex interfaces are called for.

(3) Projects where a client insists on the use of automated methods.

In the case of projects of type 1 and 2 the computer can reduce the drudgery and time involved in handling large quantities of data. For example a microcomputer could perform a forward and backward pass on a programme network of some 1000 activities in approximately 15 minutes. The most experienced planning engineer is likely to take over 50 times that duration. In addition, the computer can act as an excellent, store of project data. It can retrieve and use a multitude of data in a fraction of the time taken by equivalent manual systems.

In the past, computer power has required substantial sums of initial capital outlay to make their use prohibitive. Today computers for business applications together with associated peripherials are purchased for under ₦300,000.00 and therefore come well within the range of the smallest business or engineering practice. Computers are inexpensive and no longer only within the reach of the large companies and conglomerates. For this reason they are now being used for project management in more situations than the three earlier listed.

2.4 The Nigeria Experience

Here in Nigeria Computer approach to Project Management is almost non-existent. Most professionals lack the expertise to be involved in this approach and there is little or no literature available for work in this field. Most computer users in Nigeria still limit the facilities to basic wordprocessing and desktop publishing. It is therefore against this background of lack of literature and professional expertise, that this work would make a meaningful contribution of stimulating the Nigerian project manager into appreciating computer application to engineering project management.

CHAPTER 3

MANUAL METHOD OF PROJECT MANAGEMENT FOR THE SOKOTO HEALTH SERVICES REHABILITATION PROJECT

Based on the Terms of Reference given as illustrated in Appendix A, the extent of work would be limited to the Project Planning process. This is the most important phase of the project management life cycle. The methodology of the planning process can be broken down into four distinctive stages, namely:

(a) Work Methodology

(b) Organisational Structure

(c) Workplan

(d) Resource Analysis

3.1 Work Methodology

The works to be executed under this service are further subdivided into three main stages, namely:

Stage 1 - Pre-Contract

Stage 2 - Post-Contract

Stage 3 - As Built-Drawings/Maintenance Manual Preparation.

3.11 Stage 1

Stage 1 covers the normal services associated with stages 1 and 2 of professional services in the building industry in Nigeria. It involves the production of preliminary schemes for the approval of the Project Implementation Unit (PIU), the preparation of layout of the various hospital sites and a comprehensive survey of dilapidation and preparation of working drawings and tender documents.

For this stage of work, it is proposed that four teams of professionals are to be used.

Team 1 shall be made up of 3 *Nos professionally qualified Architects, 2 Numbers (Nos) Civil/Structural Engineers, 2 Nos Electrical/Mechanical Services Engineers, 2 Nos Quantity Surveyors and 2 Nos Land Surveyors together with 6 Nos Architectural Draughtsmen, 4 Nos Civil/Structural Detailers, 4 Nos Electrical/Mechanical Services Detailer, 4 Nos Quantity Surveying Assistants and 4 Nos Survey Assistants.* This team shall be responsible for all design and documentation works for Sokoto general Hospital and the primary health centres at Wurno and Illela. This team is so constituted because it has the largest scope of work. It is expected to complete all design and documentation works in six months and to complete the tendering procedure in three months thereafter.

Team 2: Shall be made up of 2 *Nos Architect, 2 Nos Civil/Structural engineers, 2 Nos Electrical/Mechanical Engineers, 2 Nos Quantity Surveyors and 1 No Land Surveyors together with 4 Nos Architectural Draughtsmen, 4 Nos Civil/structural Detailers, 3 Nos Electrical/Mechanical Services Detailers, 3 Nos Quantity Surveying Assistants and 2 Nos Survey Assistants.* This team shall be responsible for the works at Isa and Gusau General Hospitals and Kaura Namoda Primary Health Centre. It is expected that the team will complete all design and documentation works within the three hospitals in four months and complete the tendering procedures in three months thereafter.

Team 3: Shall be made up 2Nos Architects, 2Nos Civil/Structural Engineers, 2Nos Electrical/Mechanical Engineers, 2Nos uantity Surveyors and 1Nos Land Surveyors together with 4Nos Architectural Draugtsmen, 3Nos Civil/Structural Detailers, 3Nos Electrical/Mechanical Detailers, 3Nos uantity Surveying Assistants and 2Nos Survey

Assistants. This team shall be responsible for the design and documentation work on Gumi, Yabo and Dogon-Daji Hospitals. They are expected to complete all design and documentation work in four months and tendering procedures in three months thereafter.

Team 4: This team is similar to team 3 in composition but is responsible for the design and documentation works on Talata Mafara and Anka Hospitals. They are also expected to complete all design and documentation works on these hospitals in four months while completing the tendering process in three months thereafter.

It is important to note that the tendering process is taking three months because of the minimum tendering period of 45 days usually permitted by the ADF on projects of this nature together with the time allowed for obtaining approvals for tender documents and tender analysis reports from both the PIU and the Bank.

3.12 Stage 2

This stage covers all works associated with stage III of professional services in the building industry in Nigeria together with the provision of residency services by the various resident professionals. It is proposed that two teams of resident professionals be used. Each team shall be made up of an Architect, a Civil/Structural Engineer, an Electrical/Mechanical Services Engineer and a uantity Surveyor. It is further proposed that each hospital site will be provided with the services of a resident Clerk of works who shall be responsible to the resident teams of professionals. Each resident supervisory team shall be responsible for overseeing construction works on hospitals, assigned to it.

Team A shall be responsible for supervision of hospitals in Illela, Wurno, Sokoto, Yabo and Dogon-Daji with an operational base at Sokoto.

Team B shall be responsible for supervision of hospitals in Anka T. Mafara, Gusau, Kaura Namoda, Isa, Gumi with operational base at Gusau.

The above supervision strategy is proposed in order to ensure prompt and efficient project realisation. The sites are widely dispersed and road interlinks are in most places largely unmotorable. Thus the need to package the works in clusters to facilitate a thorough implementation of the programme. The provision of full time clerk of works on each site is informed by the fact that the works are largely rehabilitation works, marginally enhanced by new facilities. In works of this nature, the obvious tendency on the part of the contractors is to "gloss over" certain items of work in default of the requisite supervision.

The maximum length for construction works envisaged on any of the project sites is nine months. The clerks of works are therefore expected to be on site for a maximum of nine months while the supervising professionals are expected to operate beyond the supervision stage to the defects liability and preparation of As-Built drawing stage.

3.13 Stage 3

This stage comprises the preparation of Maintenance Schedule/Manual and As Built Drawings. It is proposed that the team responsible for supervision will be used for this assignment. In addition each professional in the team will be assigned the services of a draughtsman to assist in completing this responsibility.

3.14 Co-ordinating Team

A project of this nature requires adequate and effective co-ordination if the project objectives are to be realized. An overview of the programme enunciated thus far indicates a complex array of activities amongst the multi-disciplinary teams deployed at design and supervision stages. It is therefore proposed that a senior co-ordinating professional of the status of ASSOCIATE in the practice shall be provided for the co-ordination of the works of the design and supervisory teams in each relevant professional discipline. Thus our proposal provides for the services of a *Co-ordinator Architecture, a Co-ordinator Civil/Structural Engineering, a Co-Ordinator Electrical/ Mechanical Engineering and a Co-Ordinator Quantity Surveying.*

Each Co-Ordinating professional listed has a long term professional experience in both design and supervision. The Co-ordinators, while being responsible for the implementation of the strategies in the various disciplines shall also constitute the team leaders for the various project sites.

A Project Manager is also proposed. The Project Manager shall be responsible for co-ordinating the activities of the various co-ordinators in addition to ensuring that all documentation emanating from the various disciplines are in accordance with African Development Fund (ADF) requirements. He shall be responsible to the partner in charge for the administration and technical development of the project.

The overall responsibility for the project shall be vested in the Partner In-Charge, who shall be responsible to the PIU for the smooth implementation of the project components as detailed in the Term of Reference (TOR). The partner in Charge is responsible for policy formulation and shall as far as practicable ensure that overall implementation is kept within the project programme approved by the ADF. Should cost overruns become likely, the Partner in Charge shall communicate this to the PIU early enough to enable it make a case to the ADF.

Fig. 3.1 **Schedule of Work Methodology**

Stage 1 - Design Work Stage (Pre-Contract)

TEAM	HOSPITALS	KEY PERSONNEL
(1)	Sokoto General Hospital Wurno Primary Centre Illela Primary Health Centre	3Nos Architects 2Nos Civil/Structural Engrs 2Nos Elect/Mech Engrs 2Nos Quantity Surveyors 2Nos Land Surveyors
(2)	General Hospital Isa General Hospital Gusau Primary Health Centre Kaura-Namoda	2Nos Architects 2Nos Civil/Structural Engrs 2Nos Quantity Surveyors 2Nos Elect/Mech Engrs 1Nos Land Surveyors
(3)	General Hospital Gumi Primary Health Centre Yabo Primary Health Centre Dogon-Daji	2Nos Architects 2Nos Civil/Structural Engrs 2Nos Elect/Mech Engrs 2Nos Quantity Surveyors 1Nos Land Surveyors
(4)	General Hospital Talata-Mafara Primary Health Centre Anka	2Nos Architects 2Nos Civil/Structural Engrs 2Nos Elect/Mech Engrs 2Nos Quantity Surveyors 1Nos Land Surveyors

Stage 2 - Supervision

TEAM	HOSPITALS	KEY PERSONNEL
(A)	Primary Health Centre Illela Primary Health Centre Wurno General Hospital Sokoto Primary Health Centre Yabo Primary Health Centre Dogon-Daji	1 - Architects 1 - Civil/Structural Engrs 1 - Elect/Mech Engrs 1 - Quantity Surveyors 6Nos Clerk of Works
(B)	Primary Health Centre Anka General Hospital Talata-Mafara General Hospital Gusau Primary Health Centre Kaura-Namoda General Hospital Isa General Hospital Gumi	1 - Architects 1 - Civil/Structural Engrs 1 - Elect/Mech Engrs 1 - Quantity Surveyors 6 - Clerk of Works

Stage 3 - Preparation of As-Built Drawings/Maintenance Manual

TEAM	HOSPITALS	KEY PERSONNEL
(A)	SAME AS FOR STAGE 2 ABOVE	1 - Architects 1 - Civil/Structural Engrs 1 - Elect/Mech Engrs 1 - Quantity Surveyors 3Nos Draughtsmen
(B)	SAME AS FOR STAGE 2 ABOVE	1 - Architects 1 - Civil/Structural Engrs 1 - Elect/Mech Engrs 1 - Quantity Surveyors 1 - Land Surveyors 3Nos Draughtsmen

3.15 Stages of Project Execution: Work Breakdown Structure (WBS)

In line with the general approach enunciated above, the various stages in the project implementation programme are hereunder listed. The stages are further detailed into tasks for better appreciation.

3.16 Stage 1: Pre-Contract Programme

Task 1: Start Project

Task 2: Visit each of the Hospitals with a view to determining their rehabilitation and upgrading needs and producing drawings of existing facilities.

Task 3: Detail out the needs established in task 1 on a building by building basis

Task 4: Commission the production of survey drawing of each of the hospitals in the project scheme to obtain locations of the building within the site plan.

Task 5: Prepare preliminary drawings for new facilities and obtain approval from PIU

Task 6: Produce all necessary working drawings and schedule of rehabilitation

Task 7: Produce all necessary tender documents including Bill of quantities and tender drawing after agreeing with PIU on tender lots. Send draft to PIU and ADF.

Task 8: Produce and submit through the Project Co-ordinator 23 copies each of the document to the PIU.

Task 9: Proceed with PIU to Abidjan to obtain approval for contract document and issue same to pre-qualified contractors and receivesame at the expiration of tender period.

Task 10: Carry out tender evaluation and produce a tender analysis report for the preliminary approval of the PIU

Task 11: Proceed with the PIU to Abidjan to obtain final approval on the tenders report

Task 12: Issue approved contract documents to the selected contractors

Task 13: Formal handover of sites to the various contractors.

3.17 **Stage 2** **Post-Contract Programme [Normal + Residency]**

Task 14: Provide a resident clerk of work on each and every site of the project

Task 15: Provide a supervisory team to oversee each construction zone.

Task 16: Commissioning and Handing over of site to the PIU

Stage 3 **Preparation of Maintenance Schedule/Manual and As-Built Drawings.**

Task 17: **Provide as-built drawings for the following services**

(1) ***Land Surveyors Drawings***

(a) Site Location plans to the scale of 1:5000

(b) Master design plan to the scale of 1:2500

(c) Site plan to the scale of 1:500

(2) ***Architectural Drawings***

(a) Layout plans to a scale of 1:100

(b) Cross-sections/elevations to a scale of 1:100

(c) Necessary Architectural details to a scale of 1:25 and 1:50

(3) ***Civil/Structural Drawings***

(a) Structural layout drawings for new building to a scale of 1:100

(b) Structural details of building elements to a scale of 1:50

(c) Structural details solving unique site problems to a scale of 1:25

(d) Road layout details to a scale of 1:500

(c) Drainage layout to a scale of 1:500

(f) Water Supply/Reticulation layout 1:500

(4) ***Electrical/Mechanical Engineering Drawings***

(a) Site layout of Electrical services scheme to a scale of 1:500

(b) Layout of Electrical Services scheme in each building to a scale of 1:100

(c) Electrical Services details to a scale of 1:25

(d) Plumbing scheme layout. Per building (Hot & Cold water schemes)

(c) Piped gases layout per building

(5) ***Quantity Surveying Services***

(a) Final account and bills of quantities, incorporating all variations, alterations and modifications

Task 18: Provide Maintenance Manuals for the following services

(1) ***Architecture***

(a) General Painting manual

(b) Floor wall and ceiling finishes

(c) Fixtures and Fittings

(d) Roof coverings

(e) Landscaping and Environmental Protection

(2) ***Civil/Structural Engineering***

(a) Drainage Maintenance

(b) Road Rehabilitation

(c) Roof Structural Maintenance

(d) water Reticulation

(3) ***Electrical/Mechanical Services***

(a) Manuals on Electrical Services Operation Maintenance

(b) Manuals on Plumbing Operation Maintenance

(c) Preventive maintenance Manuals for Generators

(d) Preventive maintenance manuals for Airconditioners

3.18 Co-ordinating team

Task 19: Provide the services of professionally qualified co-ordinators to oversee the activities of the design and supervisory team.

Task 20 Provide the service of a project manager to be responsible for technical co-ordination and client services relation on professional matters

Task 21 Provide the services of the Partner-in-Charge who shall be responsible to the client for the overall management and direction of the Consultancy Services Scheme.

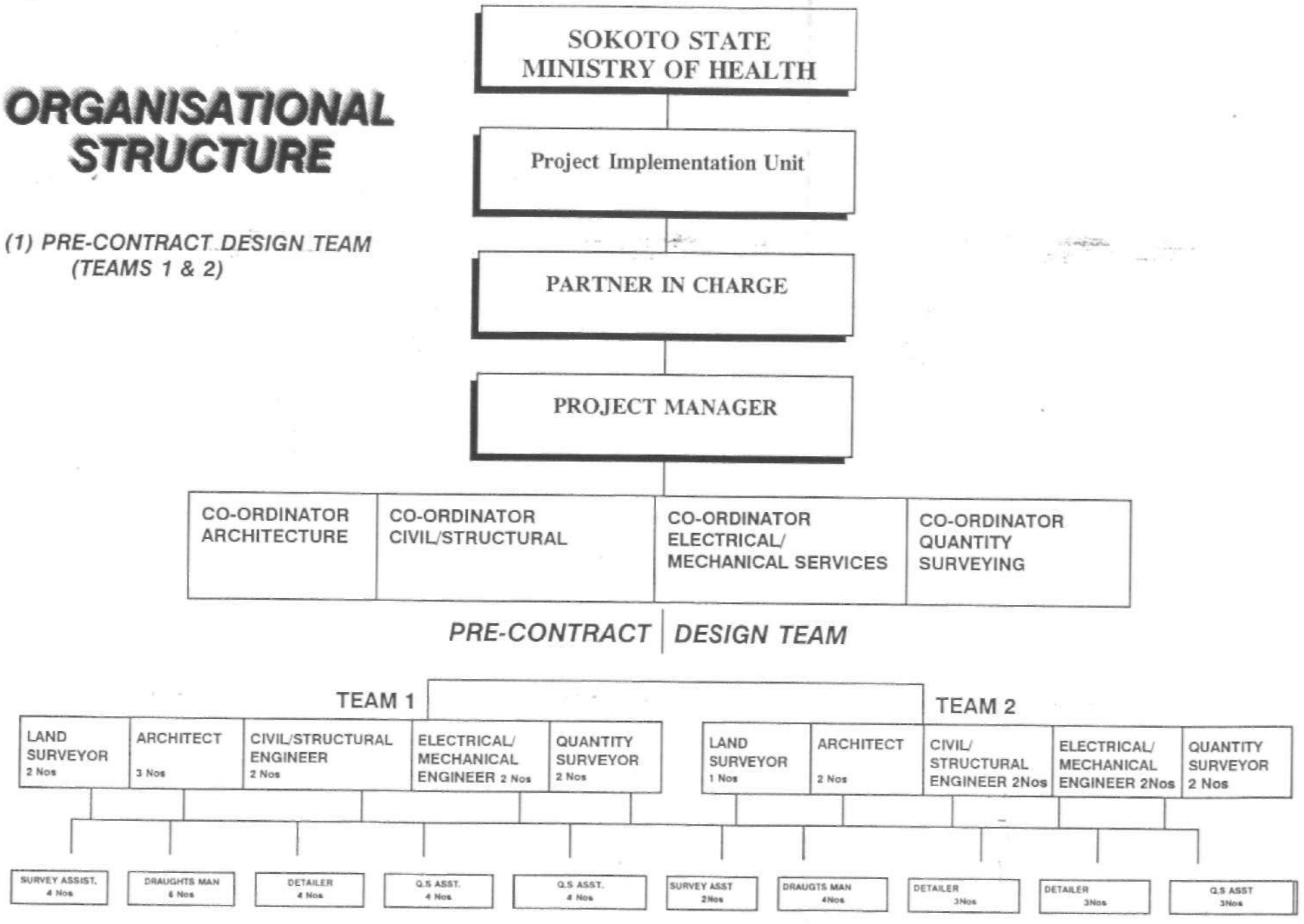
3.2 ORGANISATIONAL STRUCTURE

The work methodology is translated into an organisational structure which gives a graphical picture of the project management scheme and the communication process.

Figure 3.3

ORGANISATIONAL STRUCTURE

(1) PRE-CONTRACT DESIGN TEAM (TEAMS 1 & 2)



ORGANISATIONAL STRUCTURE

(1) PRE-CONTRACT DESIGN TEAM

(TEAMS 3 & 4)

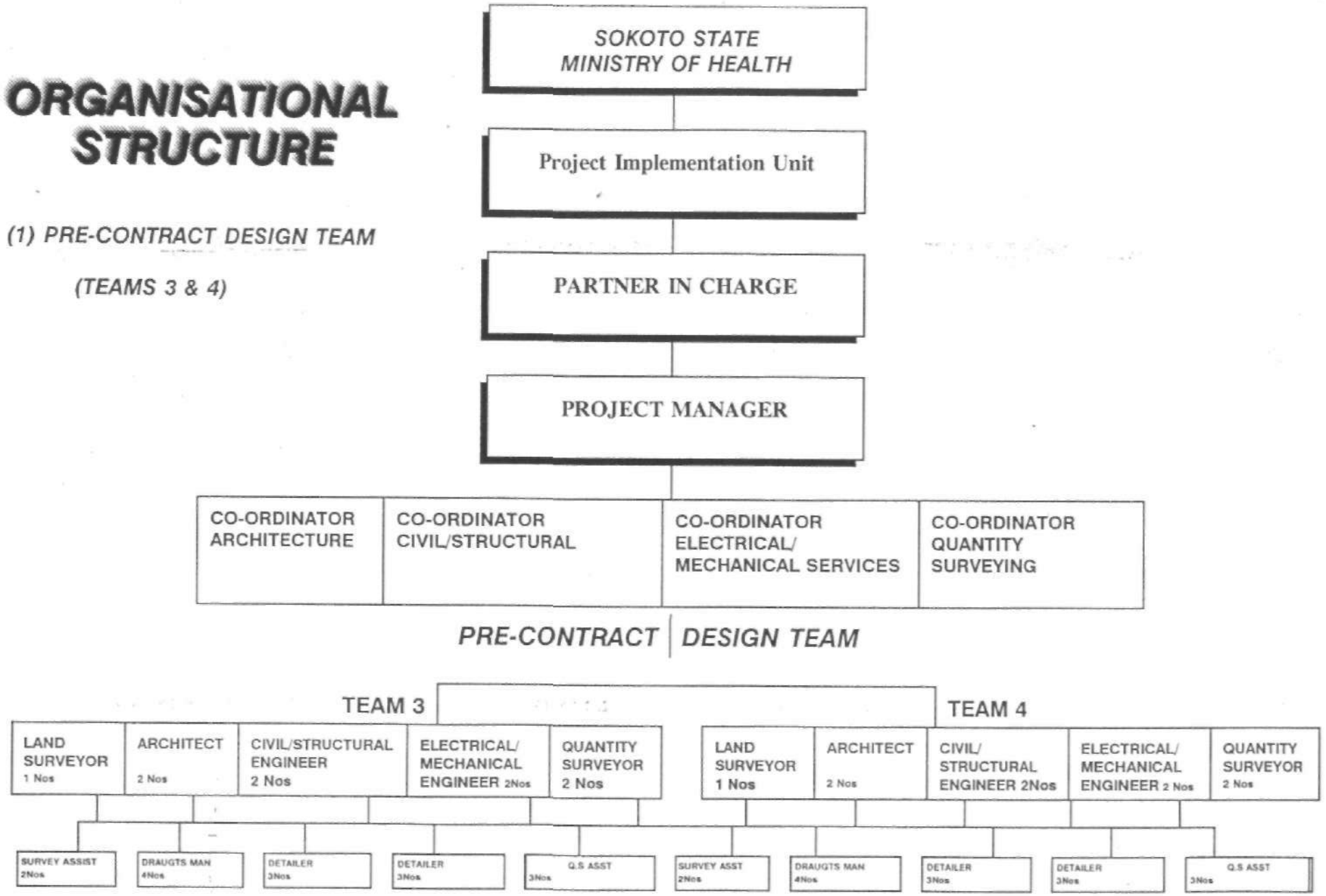
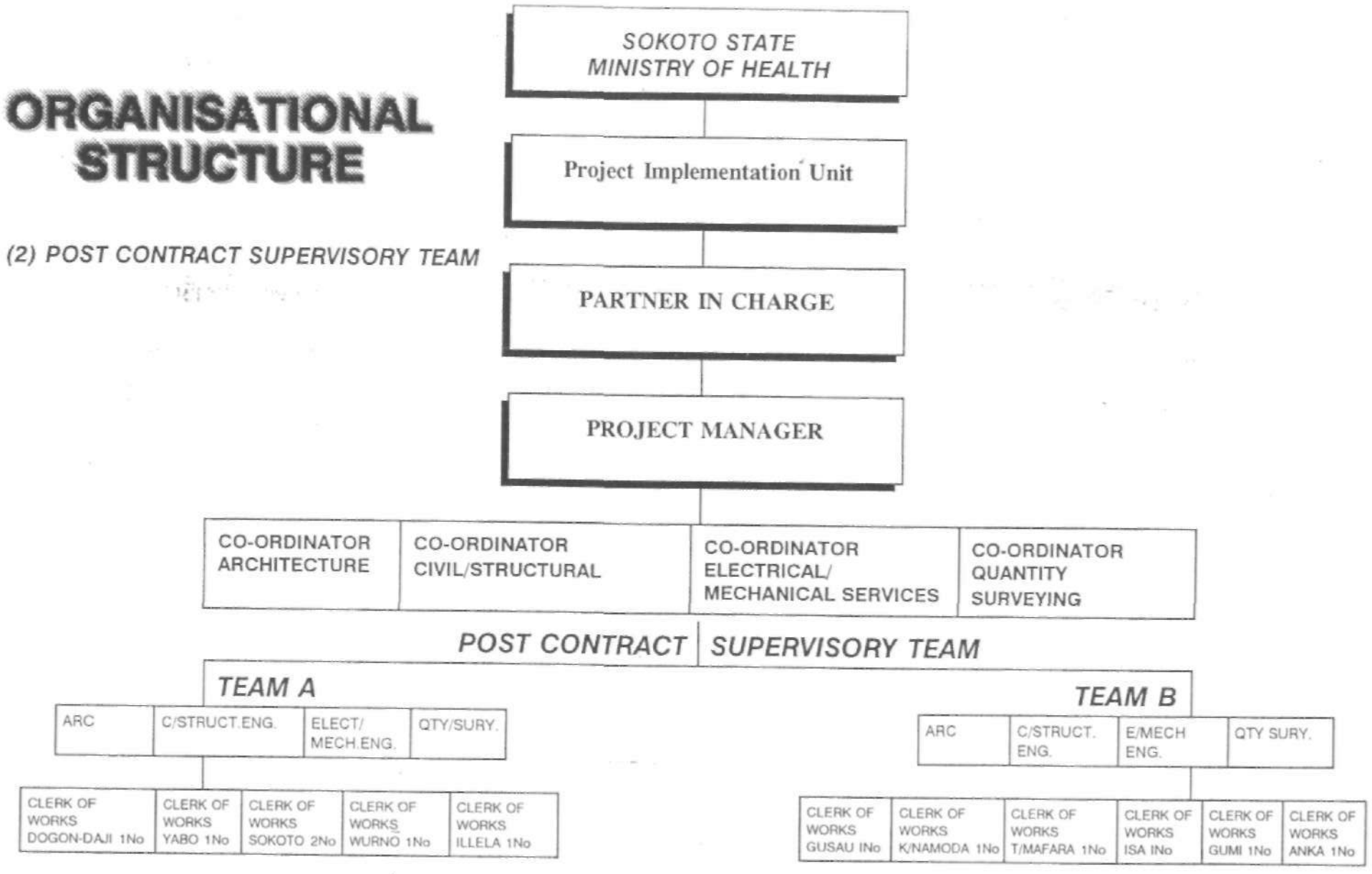


Figure 3.5

ORGANISATIONAL STRUCTURE

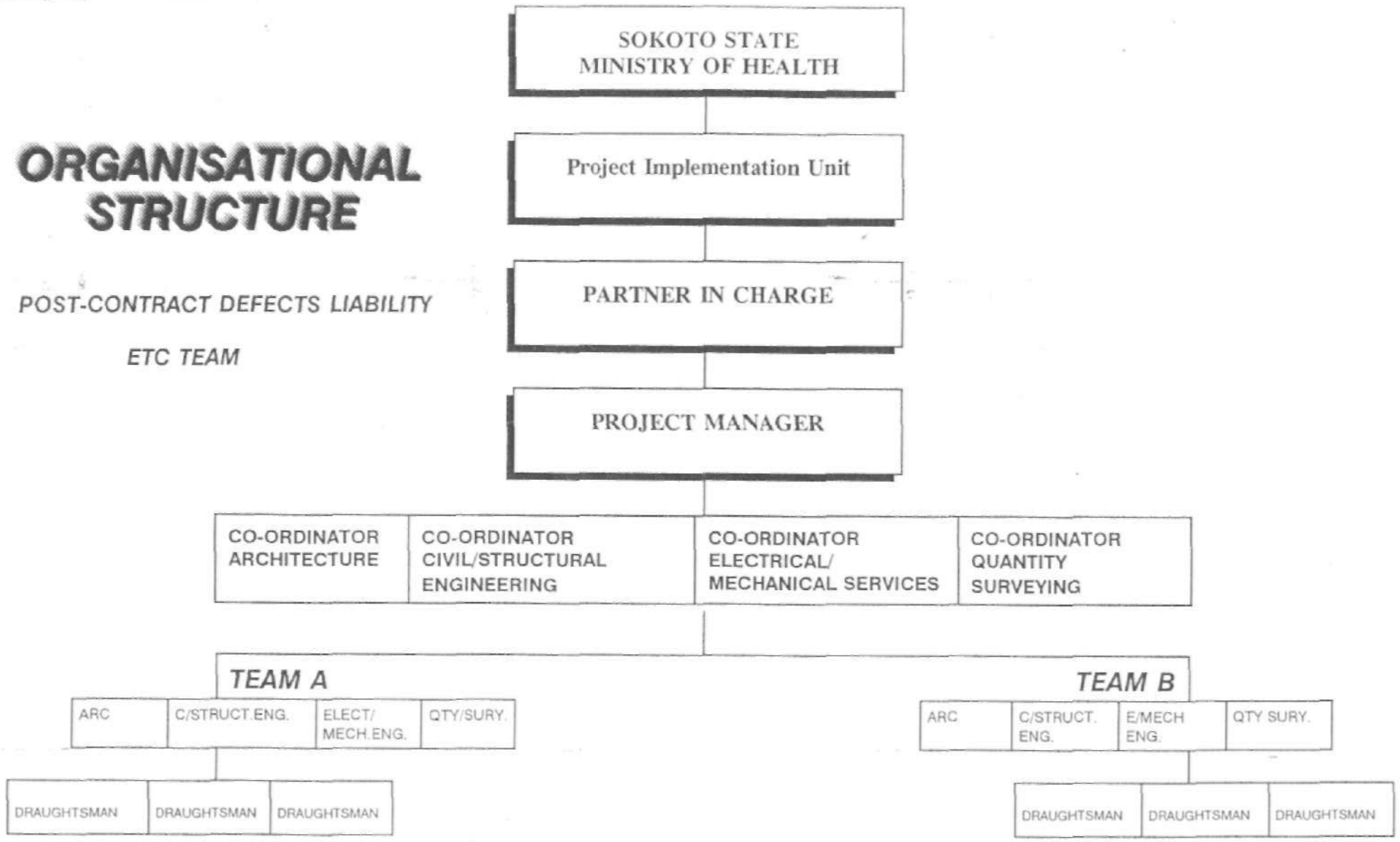
(2) POST CONTRACT SUPERVISORY TEAM



ORGANISATIONAL STRUCTURE

POST-CONTRACT DEFECTS LIABILITY

ETC TEAM



4.3 WORKPLAN

The workplan for the realisation of the project is hereafter presented. It shows details of the work programme on a graphic scale. Also shown is a global work plan reflecting the overall work schedule together with detailed workplan indicating the activities on each of the project locations.

The global workplan shows that the maximum design and tendering period permissible is 9 months. Within these nine months, certain sites (or lots) might have their pre-contract processes completed ahead of the limit and construction can therefore commence earlier. Thus an overlap of three months is scheduled to take care of this. The Maximum construction period scheduled is 12 months, while the total time allowed for defects liability and preparation of as-built drawing is 9 months inclusive of a three-month overlap. On the whole the global workplan provides for a maximum of 24 months implementation programme.

The detailed work programme portrays the schedule on a hospital by hospital basis. The workplan assigns the design works in Sokoto, Wurno and Illela hospitals to Design Team 1. Due to the large scope of work on this hospital, the maximum permissible design and tendering period of nine months is allowed. A construction period in lots of nine months is planned for, while a defects liability and As-Built Drawing preparation period of six months is provided. The workplan further assigns the design works in Isa, Gusau & Kaura Namoda Hospitals to Team 2, design works in Gumi, Yabo & Dogon-Daji Hospitals to Team 3 and designworks in Talata Mafara and Anka Hospitals to Team 4. The Precontract workplans for the foregoing hospitals are similar. Each provides for a four month design and

documentation period together with a three-month tendering period to make up the Pre -Contract Period. The supervisory workplan has Team A overseeing the works in Illela, Wurno, Sokoto, Yabo and Dogon-Daji Hospitals whilst Team B oversees the works in Anka, Talata Mafara, Gusau, Kaura Namoda, Isa and Gumi Hospitals. A nine months construction period and a six-month defects liability/maintenance Manual and As-Built Drawing preparation period are also scheduled to complete the Post-Contract Programme.

The complete suite of work Plans for the entire project is therefore as shown in Figures 3.7 to 3.13

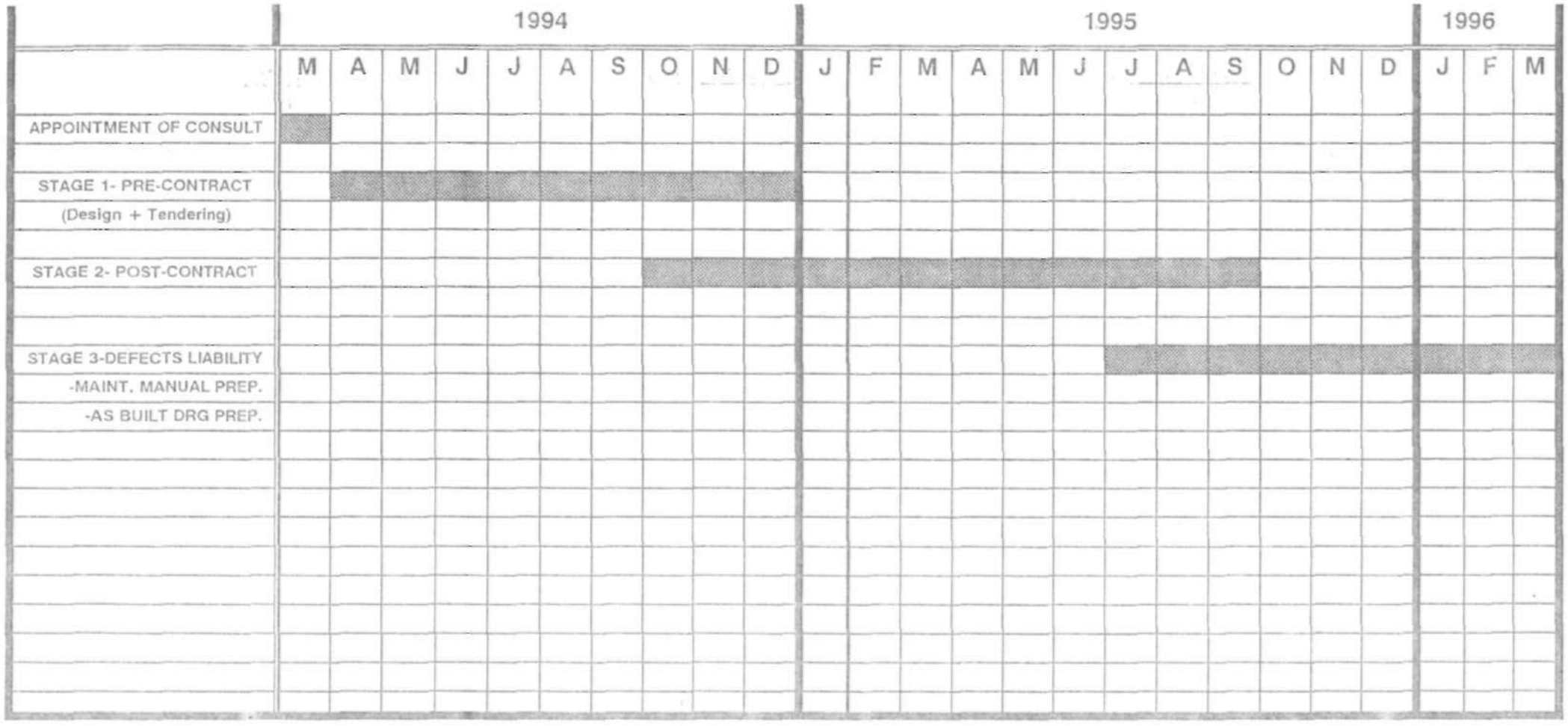
Tables 3.1 shows the Resource Analysis for the Pre-Contract Stage. The table indicates the total man month per professional, the rate per professional, the total cost of and number of professionals required for the pre-contract services.

Table 3.2 shows the Resource Analysis for the Post-Contract works. While Table 3.3 shows the Resource Analysis for the Defects Liability/Maintenance Manual and As-Built Drawing preparation period. These three tables cover the resource usage cost for the entire project period.

Figure 3.7

SOKOTO HEALTH SERVICES REHABILITATION PROJECT

GLOBAL WORK PROGRAMME - DESIGN & SUPERVISORY CONSULTANT



PRE CONTRACT ☞ DESIGN PERIOD (6 MONTHS) + TENDERING PERIOD & APPROVALS (3 MONTHS)

SOKOTO HEALTH SERVICES REHABILITATION PROJECT

DETAIL WORK PROGRAMME FOR DESIGN TEAM 1

SOKOTO+WURNO+ILLELA HOSPITALS	1994										1995												1996		
	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
STAGE 1																									
TASK 1																									
TASK 2																									
TASK 3																									
TASK 4																									
TASK 5																									
TASK 6																									
TASK 7																									
TASK 8																									
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STAGE 2																									
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TASK 14																									
TASK 15																									
STAGE 3																									
TASK 16																									
TASK 17																									
CO-ORDINATING TEAM																									
TASK 18																									
TASK 19																									
TASK 20																									

Figure 3.5

SOKOTO HEALTH SERVICES REHABILITATION PROJECT

DETAIL WORK PROGRAMME FOR DESIGN TEAM 2

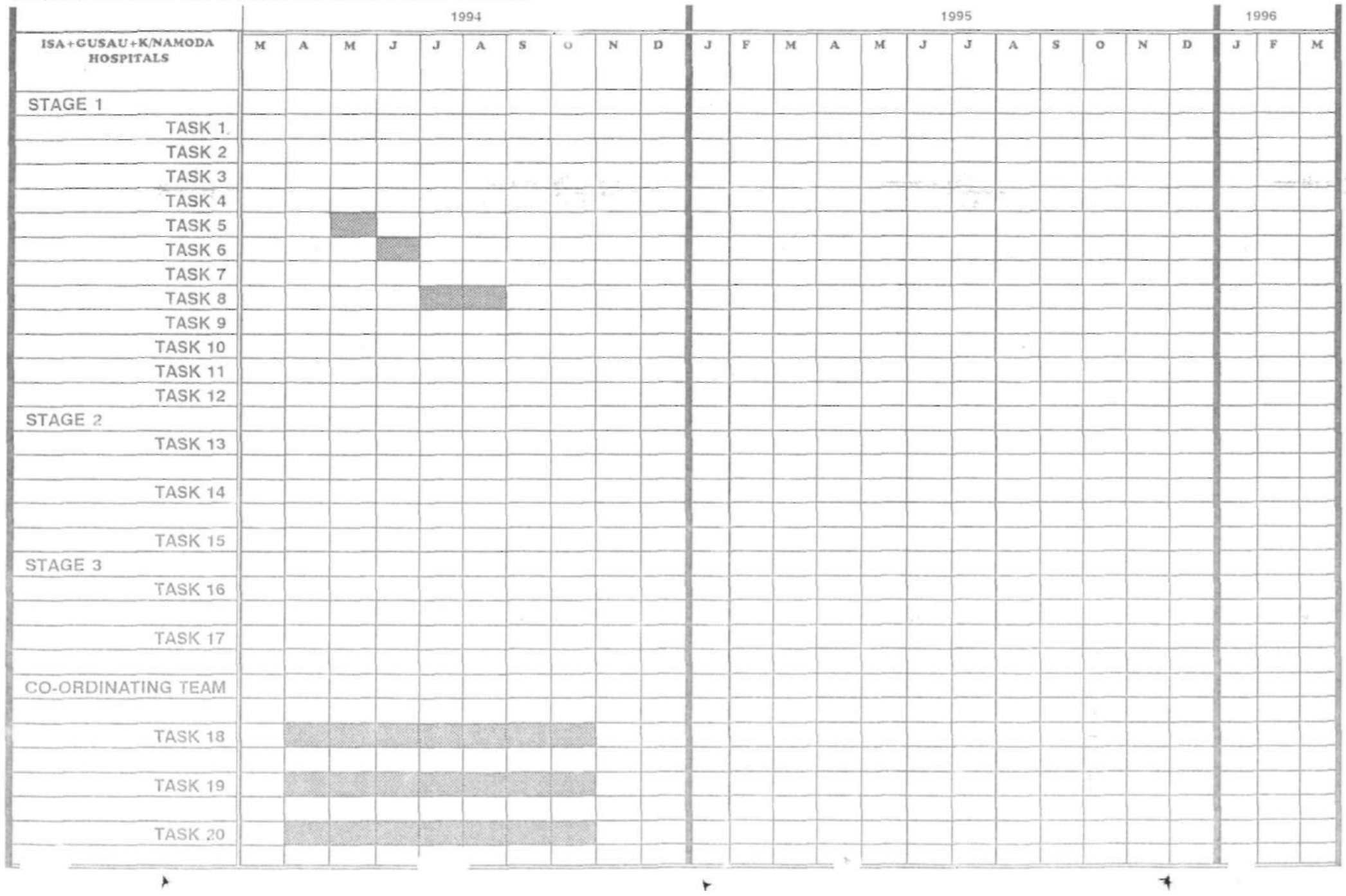


Figure 8.10

SOKOTO HEALTH SERVICES REHABILITATION PROJECT

DETAIL WORK PROGRAMME FOR DESIGN TEAM 3

GUMI+YABO+DOGON+DAJI HOSPITALS	1994										1995												1996		
	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
STAGE 1																									
TASK 1																									
TASK 2																									
TASK 3																									
TASK 4																									
TASK 5																									
TASK 6																									
TASK 7																									
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STAGE 3																									
TASK 16																									
TASK 17																									
CO-ORDINATING TEAM																									
TASK 18																									
TASK 19																									
TASK 20																									

SOKOTO HEALTH SERVICES REHABILITATION PROJECT

DETAIL WORK PROGRAMME FOR DESIGN TEAM 4

TALATA+MAFARA+ANKA HOSPITALS	1994										1995												1996		
	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	
STAGE 1																									
TASK 1																									
TASK 2																									
TASK 3																									
TASK 4																									
TASK 5																									
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CO-ORDINATING TEAM																									
TASK 18																									
TASK 19																									
TASK 20																									

Figure 3.12

SOKOTO HEALTH SERVICES REHABILITATION PROJECT

DETAIL WORK PROGRAMME FOR SUPERVISORY TEAM A

ILLELA+WURNO+SOKOTO+ ABO+DOGON-DAJI HOSPITALS	1994										1995												1996		
	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
STAGE 1																									
TASK 1																									
TASK 2																									
TASK 3																									
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TASK 16																									
TASK 17																									
CO-ORDINATING TEAM																									
TASK 18																									
TASK 19																									
TASK 20																									

Figure 3.13

SOKOTO HEALTH SERVICES REHABILITATION PROJECT

DETAIL WORK PROGRAMME FOR SUPERVISORY TEAM B

GUSAU+K/NAMODA+ISA+T/MAFARA+ANKA HOSPITALS	1994										1995												1996		
	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
STAGE 1																									
TASK 1																									
TASK 2																									
TASK 3																									
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TASK 17																									
CO-ORDINATING TEAM																									
TASK 18																									
TASK 19																									
TASK 20																									

Table 3.1

3.4 Resource Analysis Pre-Contract

PROFESSIONALS *STAGE 1 - PRECONTRACT*	TOTAL MAN MONTH PER PROFESSIONAL	RATE	TOTAL COST PER PROF.	NOS. OF PROF. REQD	TOTAL COST
PARTNER-IN-CHARGE	9	30,000	270,000	1	270,000
PROJECT MANAGER	9	25,000	225,000	1	225,000
CO-ORDINATOR ARCHITECTURE	9	20,000	180,000	1	180,000
CO-ORDINATOR CIVIL/STRUCT.	6	20,000	120,000	1	120,000
CO-ORDINATOR ELECT/MECH.	6	20,000	120,000	1	120,000
CO-ORDINATOR Q.S.	9	20,000	180,000	1	180,000
DESIGN ARCH. TEAM 1	6	15,000	90,000	3	270,000
DITTO CIVIL/STRUCT. TEAM 1	6	15,000	90,000	2	180,000
DITTO ELECT/MECH TEAM 1	6	15,000	90,000	2	180,000
PRECONTRACT Q.S. TEAM 1	6	15,000	90,000	2	180,000
DESIGN ARCH. TEAMS 2, 3-4	4	15,000	60,000	6	360,000
DITTO CIVIL/STRUCT DO	4	15,000	60,000	6	360,000
DITTO ELECT/MECH DO	4	15,000	60,000	6	360,000
PRECONTRACT Q.S. DO	4	15,000	60,000	6	360,000
LAND SURVEYORS TEAM 1-4	4	15,000	60,000	5	300,000
ARCH. DRAUGHTSMAN TEAM 1	6	10,000	60,000	6	360,000
STRUCT. DETAILER DO	6	10,000	60,000	4	240,000
ELECT/MECH DETAILER DO	6	10,000	60,000	4	240,000
Q.S. ASSISTANT DO	6	10,000	60,000	4	240,000
ARCH DRAUGHTSMAN	6	10,000	60,000	18	1,080,00
TEAMS 2, 3 & 4	4	10,000	40,000	12	480,000
STRUCT. DETAILER DO	4	10,000	40,000	9	360,000
ELECT/MECH DETAILER DO	4	10,000	40,000	9	360,000
Q.S. ASSISTANT DO	4	10,000	40,000	9	360,000
SURVEYOR ASST TEAMS 1-4	4	10,000	40,000	10	400,000
TOTAL FOR PRECONTRACT					**6,685,000**

Table 3.2

Resource Analysis - Post Contract

PROFESSIONALS *STAGE 2 - POST-CONTRACT*	TOTAL MAN MONTH PER PROFESSIONAL	RATE	TOTAL COST PER PROF.	NOS. OF PROF. REQD	TOTAL COST
PARTNER-IN-CHARGE	9	30,000	270,000	1	270,000
PROJECT CO-ORDINATOR	9	25,000	225,000	1	225,000
CO-ORDINATOR ARCHITECTURE	9	20,000	180,000	1	180,000
CO-ORDINATOR CIVIL/STRUCT.	9	20,000	180,000	1	180,000
CO-ORDINATOR ELECT/MECH.	9	20,000	180,000	1	180,000
CO-ORDINATOR Q.S.	9	20,000	180,000	1	180,000
RESIDENT ARCHITECT	9	15,000	135,000	2	270,000
RESIDENT CIVIL/STRUCT.	9	15,000	135,000	2	270,000
RESIDENT ELECT/MECH.	9	15,000	135,000	2	270,000
POST-CONTRACT Q.S.	9	15,000	135,000	2	270,000
CLERK OF WORKS	9	10,000	90,000	12	1,080,000
					3,375,000

Table 3.3

Resource Analysis:- Defects Liability/Maintenance Manual & As-Built DRG Prep.

PROFESSIONALS *STAGE 3 - POST-CONTRACT*	TOTAL MAN MONTH PER PROFESSIONAL	RATE	TOTAL COST PER PROF.	NOS. OF PROF. REQD	TOTAL COST
PARTNER-IN-CHARGE	6	30,000	180,000	1	180,000
PROJECT CO-ORDINATOR	6	25,000	150,000	1	150,000
CO-ORDINATOR ARCHITECTURE	6	20,000	120,000	1	120,000
CO-ORDINATOR CIVIL/STRUCT.	6	20,000	120,000	1	120,000
CO-ORDINATOR ELECT/MECH.	6	20,000	120,000	1	120,000
CO-ORDINATOR Q.S.	6	20,000	120,000	1	120,000
RESIDENT ARCHITECT	6	15,000	90,000	2	180,000
RESIDENT CIVIL/STRUCT.	6	15,000	90,000	2	180,000
RESIDENT ELECT/MECH.	6	15,000	90,000	2	180,000
POST-CONTRACT Q.S.	6	15,000	90,000	2	180,000
DRAUGHTS MEN	6	10,000	60,000	6	360,000
					1,890,000

SUMMARY COST OF RESOURCES

(1)	Pre-Contract	=	₦6,685,000.00
(2)	Post-Contract	=	₦3,375,000.00
(3)	Defects Liability	=	₦1,890,000.00
			₦11,950,000.00

CHAPTER 4

COMPUTER METHODS IN PROJECT MANAGEMENT

The Computer method in engineering project management adopts a planned process which can be broken down into the following steps.

Step 1: Project Definition. This definition includes an outline of:

(a) The project stages

(b) Objectives of the project

(c) Assumptions if any

(d) Scope of work

Step 2: Development of the Work Breakdown Structure (WBS). This structure is a procedure of systematically breaking down the works to a manageable level of details. The WBS will then be used to determine resource requirement, duration and cost. Also the WBS is used for assigning responsibility, developing budgets and schedules, and finally monitoring and controlling the project.

Step 3: Determination of activity relationships with input from the work breakdown structure. It is necessary to determine the sequence in which the work would be undertaken.

Step 4: Estimating - This step consists of estimating the time cost and resources required to complete each task, function or activity.

Step 5: Data developed from step 1 to 4 is input into the computer using Microsoft Project Software. The data is processed, analysed and results obtained.

For effective understanding of computer methods to engineering project management using the Sokoto Health Services Rehabilitation Project as a case study, the stages of project execution adopted in the manual approach will be used as the tasks for the WBS in the computer application. The steps enumerated above would be adopted for the work methodology.

Step 1: **Project Definition**

The work involves the application of computer methods in engineering project planning, using the Sokoto Health Services Rehabilitation Project as a test case. The project stages shall be subdivided into eighteen (18) tasks that would constitute the Work Breakdown Structure. The Scope of work will be limited to the planning processes.

Step 2: **Development of Work Breakdown Structure**

The entire project planning process is further subdivided into 18 different tasks as shown in the accompanying task sheet. The scheduled start and scheduled finish date of each task is then determined and provided for in the task sheet.

Step 3: The activity relationship is determined. There are four main types of relationships, these are :

(1) Finish to Start (FS) relationship. This means that one task cannot start until another task is completed. The task that must finish before the other can start is called the PREDECESSOR. The task that depend on the other to finish before it starts is the SUCCESSOR. Other relationships include:

Start to Start (SS)

Finish to Finish (FF)

Start to Finish (SF). Having determined the relationship between tasks, this is entered in the task sheet under the predecessor column. Finally the name of the Chief resource person for each task is entered against the task to complete the task sheet entry form.

Step 4: The resource needed to accomplish each task is then determined. The resource is usually listed in the form of men and equipment. Thus for each task, a resource list is developed. The time to be expended by each resource in accomplishing the task and the unit cost of the resource are also entered in the resource sheet. This step is the most critical step in the generation of input data for the computer and must be carried out by a very experienced professional.

Step 5: Data developed and input into the computer from step 1 to 4 are now processed by the computer and generate various results and reports.

Microsoft Project (The Software Used) has capacity to generate numerous reports and graphical views to enable the manager effectively monitor, control and replan the project during its implementation. The results generated from the data input include:

(1) Schedule of Tasks

(2) Schedule of Resources

(3) Cost per Task

(4) Cost of Using each Resource

(5) Gantt Chart

(6) PERT Chart

(7) Summary Cost of Project

Finally it must be emphasised that both the manual and computer methods are based on the same organisational structure and concept. Costings on the computer method has adopted the dollar sign, which is what is available in the software being used. Thus it is to be assumed that the naira and dollar signs are mere signs and do not affect the value of the amount listed against them. Thus one dollar in the computer method is assumed equal to one naira in the manual method.

Sokoto Health Services Rehabilitation Project – SCHEDULE OF TASKS

ID	Name	Duration	Scheduled Start	Scheduled Finish
1	Start Project	0w	2/1/95 8:00am	2/1/95 8:00am
2	Visit each hospital	2w	2/1/95 8:00am	2/14/95 5:00pm
3	Detail out needs in hospitals	2w	2/15/95 8:00am	2/28/95 5:00pm
4	Survey each hospital	2w	2/15/95 8:00am	2/28/95 5:00pm
5	Prepare preliminary drawings	4w	3/1/95 8:00am	3/28/95 5:00pm
6	Produce working drawings	8w	3/29/95 8:00am	5/23/95 5:00pm
7	Produce tender documents	8w	5/24/95 8:00am	7/18/95 5:00pm
8	Obtain PIU approvals	2w	7/5/95 8:00am	7/18/95 5:00pm
9	Obtain ADF approvals and issue	8w	7/19/95 8:00am	9/12/95 5:00pm
10	Carry out tender evaluation	1w	9/13/95 8:00am	9/19/95 5:00pm
11	Approval for tender evaluation	1w	9/20/95 8:00am	9/26/95 5:00pm
12	Issue approved tender docs	2w	9/27/95 8:00am	10/10/95 5:00pm
13	Handover site to contractor	2w	9/27/95 8:00am	10/10/95 5:00pm
14	Provide resident clerk of works	36w	10/11/95 8:00am	6/18/96 5:00pm
15	Provide supervisory team	36w	10/11/95 8:00am	6/18/96 5:00pm
16	Commission and handover site	12w	6/19/96 8:00am	9/10/96 5:00pm
17	Provide as-built drawings	16w	9/11/96 8:00am	12/31/96 5:00pm
18	Provide maintenance manual	16w	9/11/96 8:00am	12/31/96 5:00pm

Sokoto Health Services Rehabilitation Project – SCHEDULE OF RESOURCES

ID	Name	Initials	Group	Max. Units	Std. Rate
1	Partner In Charge	PIC	Management	1	$7,500.00/w
2	Project Co-ordinator	PC	Management	1	$6,250.00/w
3	Co-ordinator Architecture	CA	Management	1	$5,000.00/w
4	Co-ordinator Civil/Structural	CSE	Management	1	$5,000.00/w
5	Co-ordinator Elect/Mech Eng	CEM	Management	1	$5,000.00/w
6	Co-ordinator Quantity Surve	CQS	Management	1	$5,000.00/w
7	Architect 1	ARC!	Professionals	3	$3,750.00/w
8	Architect 2	ARC2	Professionals	6	$3,750.00/w
9	Architect 3	ARC3	Professionals	2	$3,750.00/w
10	Civil/Structural Eng 1	CSE1	Professionals	2	$3,750.00/w
11	Civil/Structural Engr. 2	CSE2	Professionals	6	$3,750.00/w
12	Civil/Structural Engr. 3	CSE3	Professionals	2	$3,750.00/w
13	Elect./Mech. Engr. 1	EME1	Professionals	2	$3,750.00/w
14					
15	Elect./Mech. Engr. 2	EME2	Professionals	6	$3,750.00/w
16	Elect./Mech. Engr. 3	EME3	Professionals	2	$3,750.00/w
17	Quantity Surveyor 1	QS1	Professionals	2	$3,750.00/w
18	Quanrtity Surveyor 2	QS2	Professionals	6	$3,750.00/w
19	Quantity Surveyor 3	QS3	Professionals	2	$3,750.00/w
20	Architectural Technician 1	AT1	Technician	6	$2,500.00/w
21	Architectural Technician 2	AT2	Technician	12	$2,500.00/w
22	Civil/Structural Technician 1	CST1	Technician	4	$2,500.00/w
23	Civil/Structural Technician 2	CST2	Technician	9	$2,500.00/w
24	Elect./Mech. Technician 1	EMT1	Technician	4	$2,500.00/w
25	Elect./Mech. Technician 2	EMT2	Technician	9	$2,500.00/w
26	Quantity Surveying Assistan	QSA1	Technician	4	$2,500.00/w
27	Quantity Surveying Assistan	QSA2	Technician	9	$2,500.00/w
28	Land Surveyor	LS	Professional	5	$3,750.00/w
29	Land Surveyors Assistant	LSA	Technician	10	$2,500.00/w
30	Clerk of Works	CoW	Technician	12	$2,500.00/w
31	Architectural Technician 3	AT3	Technician	2	$2,500.00/w
32	Civil/Structural Technician 3	CST3	Technician	2	$2,500.00/w
33	Elect./Mech. Technician 3	EMT3	Technician	2	$2,500.00/w
34	Co-ordinator Elect./Mech. En	C		1	$0.00/h

Sokoto Health Services Rehabilitation Project

ID	Name	Duration	Scheduled Start	Scheduled Finish
1	Start Project	0w	2/1/95 8:00am	2/1/95 8:00am

ID	Successor Name	Type	Lag
2	Visit each hospital	FS	0d

2	Visit each hospital	2w	2/1/95 8:00am	2/14/95 5:00pm

ID	Predecessor Name	Type	Lag
1	Start Project	FS	0d

ID	Successor Name	Type	Lag
3	Detail out needs in hospitals	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	80h	0h	2/1/95 8:00am	2/14/95 5:00pm
2	Project Co-ordinator	1	80h	0h	2/1/95 8:00am	2/14/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	80h	0h	2/1/95 8:00am	2/14/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	80h	0h	2/1/95 8:00am	2/14/95 5:00pm
7	Architect 1	3	80h	0h	2/1/95 8:00am	2/6/95 10:40am
8	Architect 2	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
10	Civil/Structural Eng 1	2	80h	0h	2/1/95 8:00am	2/7/95 5:00pm
11	Civil/Structural Engr. 2	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
13	Elect./Mech. Engr. 1	2	80h	0h	2/1/95 8:00am	2/7/95 5:00pm
15	Elect./Mech. Engr. 2	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
17	Quantity Surveyor 1	2	80h	0h	2/1/95 8:00am	2/7/95 5:00pm
18	Quanrtity Surveyor 2	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
20	Architectural Technician 1	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
21	Architectural Technician 2	12	80h	0h	2/1/95 8:00am	2/1/95 3:40pm
22	Civil/Structural Technician 1	4	80h	0h	2/1/95 8:00am	2/3/95 12:00pm
23	Civil/Structural Technician 2	9	80h	0h	2/1/95 8:00am	2/2/95 8:53am
24	Elect./Mech. Technician 1	4	80h	0h	2/1/95 8:00am	2/3/95 12:00pm
25	Elect./Mech. Technician 2	9	80h	0h	2/1/95 8:00am	2/2/95 8:53am
26	Quantity Surveying Assistant 1	4	80h	0h	2/1/95 8:00am	2/3/95 12:00pm
27	Quantity Surveying Assistant 2	9	80h	0h	2/1/95 8:00am	2/2/95 8:53am
28	Land Surveyor	5	80h	0h	2/1/95 8:00am	2/2/95 5:00pm
29	Land Surveyors Assistant	10	80h	0h	2/1/95 8:00am	2/1/95 5:00pm

3	Detail out needs in hospitals	2w	2/15/95 8:00am	2/28/95 5:00pm

ID	Predecessor Name	Type	Lag
2	Visit each hospital	FS	0d

ID	Successor Name	Type	Lag
4	Survey each hospital	SS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	80h	0h	2/15/95 8:00am	2/28/95 5:00pm
2	Project Co-ordinator	1	80h	0h	2/15/95 8:00am	2/28/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	80h	0h	2/15/95 8:00am	2/28/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	80h	0h	2/15/95 8:00am	2/28/95 5:00pm
7	Architect 1	3	80h	0h	2/15/95 8:00am	2/20/95 10:40am
8	Architect 2	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
10	Civil/Structural Eng 1	2	80h	0h	2/15/95 8:00am	2/21/95 5:00pm
11	Civil/Structural Engr. 2	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
13	Elect./Mech. Engr. 1	2	80h	0h	2/15/95 8:00am	2/21/95 5:00pm
15	Elect./Mech. Engr. 2	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
17	Quantity Surveyor 1	2	80h	0h	2/15/95 8:00am	2/21/95 5:00pm
18	Quanrtity Surveyor 2	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
20	Architectural Technician 1	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
21	Architectural Technician 2	12	80h	0h	2/15/95 8:00am	2/15/95 3:40pm
22	Civil/Structural Technician 1	4	80h	0h	2/15/95 8:00am	2/17/95 12:00pm
23	Civil/Structural Technician 2	9	80h	0h	2/15/95 8:00am	2/16/95 8:53am
24	Elect./Mech. Technician 1	4	80h	0h	2/15/95 8:00am	2/17/95 12:00pm
25	Elect./Mech. Technician 2	9	80h	0h	2/15/95 8:00am	2/16/95 8:53am
26	Quantity Surveying Assistant 1	4	80h	0h	2/15/95 8:00am	2/17/95 12:00pm
27	Quantity Surveying Assistant 2	9	80h	0h	2/15/95 8:00am	2/16/95 8:53am
28	Land Surveyor	5	80h	0h	2/15/95 8:00am	2/16/95 5:00pm
29	Land Surveyors Assistant	10	80h	0h	2/15/95 8:00am	2/15/95 5:00pm

4	Survey each hospital	2w	2/15/95 8:00am	2/28/95 5:00pm

ID	Predecessor Name	Type	Lag
3	Detail out needs in hospitals	SS	0d

ID	Successor Name	Type	Lag
5	Prepare preliminary drawings	FS	0d

ID	Name	Duration	Scheduled Start	Scheduled Finish

"Survey each hospital" continued

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
28	Land Surveyor	5	400h	0h	2/15/95 8:00am	2/28/95 5:00pm
29	Land Surveyors Assistant	10	80h	0h	2/15/95 8:00am	2/15/95 5:00pm

5 Prepare preliminary drawings 4w 3/1/95 8:00am 3/28/95 5:00pm

ID	Predecessor Name	Type	Lag
4	Survey each hospital	FS	0d

ID	Successor Name	Type	Lag
6	Produce working drawings	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	160h	0h	3/1/95 8:00am	3/28/95 5:00pm
3	Co-ordinator Architecture	1	160h	0h	3/1/95 8:00am	3/28/95 5:00pm
6	Co-ordinator Quantity Surveying	1	160h	0h	3/1/95 8:00am	3/28/95 5:00pm
7	Architect 1	3	160h	0h	3/1/95 8:00am	3/9/95 2:20pm
8	Architect 2	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
10	Civil/Structural Eng 1	2	160h	0h	3/1/95 8:00am	3/14/95 5:00pm
11	Civil/Structural Engr. 2	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
13	Elect./Mech. Engr. 1	2	160h	0h	3/1/95 8:00am	3/14/95 5:00pm
15	Elect./Mech. Engr. 2	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
17	Quantity Surveyor 1	2	160h	0h	3/1/95 8:00am	3/14/95 5:00pm
18	Quanrtity Surveyor 2	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
20	Architectural Technician 1	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
21	Architectural Technician 2	12	160h	0h	3/1/95 8:00am	3/2/95 2:20pm
22	Civil/Structural Technician 1	4	160h	0h	3/1/95 8:00am	3/7/95 5:00pm
23	Civil/Structural Technician 2	9	160h	0h	3/1/95 8:00am	3/3/95 9:47am
24	Elect./Mech. Technician 1	4	160h	0h	3/1/95 8:00am	3/7/95 5:00pm
25	Elect./Mech. Technician 2	9	160h	0h	3/1/95 8:00am	3/3/95 9:47am
26	Quantity Surveying Assistant 1	4	160h	0h	3/1/95 8:00am	3/7/95 5:00pm
27	Quantity Surveying Assistant 2	9	160h	0h	3/1/95 8:00am	3/3/95 9:47am
28	Land Surveyor	5	160h	0h	3/1/95 8:00am	3/6/95 5:00pm
29	Land Surveyors Assistant	10	160h	0h	3/1/95 8:00am	3/2/95 5:00pm

6 Produce working drawings 8w 3/29/95 8:00am 5/23/95 5:00pm

ID	Predecessor Name	Type	Lag
5	Prepare preliminary drawings	FS	0d

ID	Successor Name	Type	Lag
7	Produce tender documents	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
2	Project Co-ordinator	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
3	Co-ordinator Architecture	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
6	Co-ordinator Quantity Surveying	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
7	Architect 1	3	320h	0h	3/29/95 8:00am	4/17/95 10:40am
8	Architect 2	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm
10	Civil/Structural Eng 1	2	320h	0h	3/29/95 8:00am	4/25/95 5:00pm
11	Civil/Structural Engr. 2	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm
13	Elect./Mech. Engr. 1	2	320h	0h	3/29/95 8:00am	4/25/95 5:00pm
15	Elect./Mech. Engr. 2	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm
17	Quantity Surveyor 1	2	320h	0h	3/29/95 8:00am	4/25/95 5:00pm
18	Quanrtity Surveyor 2	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm
20	Architectural Technician 1	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm
21	Architectural Technician 2	12	320h	0h	3/29/95 8:00am	4/3/95 10:40am
22	Civil/Structural Technician 1	4	320h	0h	3/29/95 8:00am	4/11/95 5:00pm
23	Civil/Structural Technician 2	9	320h	0h	3/29/95 8:00am	4/4/95 11:33am
24	Elect./Mech. Technician 1	4	320h	0h	3/29/95 8:00am	4/11/95 5:00pm
25	Elect./Mech. Technician 2	9	320h	0h	3/29/95 8:00am	4/4/95 11:33am
26	Quantity Surveying Assistant 1	4	320h	0h	3/29/95 8:00am	4/11/95 5:00pm
27	Quantity Surveying Assistant 2	9	320h	0h	3/29/95 8:00am	4/4/95 11:33am
28	Land Surveyor	5	320h	0h	3/29/95 8:00am	4/7/95 5:00pm
29	Land Surveyors Assistant	10	320h	0h	3/29/95 8:00am	4/3/95 5:00pm

7 Produce tender documents 8w 5/24/95 8:00am 7/18/95 5:00pm

ID	Predecessor Name	Type	Lag
6	Produce working drawings	FS	0d

ID	Successor Name	Type	Lag
8	Obtain PIU approvals	FF	0d

ID	Name	Duration	Scheduled Start	Scheduled Finish

"Produce tender documents" continued

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
2	Project Co-ordinator	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
3	Co-ordinator Architecture	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
6	Co-ordinator Quantity Surveying	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
7	Architect 1	3	320h	0h	5/24/95 8:00am	6/12/95 10:40am
8	Architect 2	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
10	Civil/Structural Eng 1	2	320h	0h	5/24/95 8:00am	6/20/95 5:00pm
11	Civil/Structural Engr. 2	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
13	Elect./Mech. Engr. 1	2	320h	0h	5/24/95 8:00am	6/20/95 5:00pm
15	Elect./Mech. Engr. 2	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
17	Quantity Surveyor 1	2	320h	0h	5/24/95 8:00am	6/20/95 5:00pm
18	Quantity Surveyor 2	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
20	Architectural Technician 1	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
21	Architectural Technician 2	12	320h	0h	5/24/95 8:00am	5/29/95 10:40am
22	Civil/Structural Technician 1	4	320h	0h	5/24/95 8:00am	6/6/95 5:00pm
23	Civil/Structural Technician 2	9	320h	0h	5/24/95 8:00am	5/30/95 11:33am
24	Elect./Mech. Technician 1	4	320h	0h	5/24/95 8:00am	6/6/95 5:00pm
25	Elect./Mech. Technician 2	9	320h	0h	5/24/95 8:00am	5/30/95 11:33am
26	Quantity Surveying Assistant 1	4	320h	0h	5/24/95 8:00am	6/6/95 5:00pm
27	Quantity Surveying Assistant 2	9	320h	0h	5/24/95 8:00am	5/30/95 11:33am

8 Obtain PIU approvals 2w 7/5/95 8:00am 7/18/95 5:00pm

ID	Predecessor Name	Type	Lag
7	Produce tender documents	FF	0d

ID	Successor Name	Type	Lag
9	Obtain ADF approvals and issue docs	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
2	Project Co-ordinator	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm
3	Co-ordinator Architecture	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm
6	Co-ordinator Quantity Surveying	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm

9 Obtain ADF approvals and issue 8w 7/19/95 8:00am 9/12/95 5:00pm

ID	Predecessor Name	Type	Lag
8	Obtain PIU approvals	FS	0d

ID	Successor Name	Type	Lag
10	Carry out tender evaluation	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm
2	Project Co-ordinator	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm
3	Co-ordinator Architecture	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm
6	Co-ordinator Quantity Surveying	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm

10 Carry out tender evaluation 1w 9/13/95 8:00am 9/19/95 5:00pm

ID	Predecessor Name	Type	Lag
9	Obtain ADF approvals and issue docs	FS	0d

ID	Successor Name	Type	Lag
11	Approval for tender evaluation	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm
2	Project Co-ordinator	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm
3	Co-ordinator Architecture	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm
6	Co-ordinator Quantity Surveying	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm
7	Architect 1	3	40h	0h	9/13/95 8:00am	9/14/95 2:20pm
8	Architect 2	6	40h	0h	9/13/95 8:00am	9/13/95 3:40pm
13	Elect./Mech. Engr. 1	2	40h	0h	9/13/95 8:00am	9/15/95 12:00pm
15	Elect./Mech. Engr. 2	6	40h	0h	9/13/95 8:00am	9/13/95 3:40pm
17	Quantity Surveyor 1	2	40h	0h	9/13/95 8:00am	9/15/95 12:00pm
18	Quanrtity Surveyor 2	6	40h	0h	9/13/95 8:00am	9/13/95 3:40pm

11 Approval for tender evaluation 1w 9/20/95 8:00am 9/26/95 5:00pm

ID	Predecessor Name	Type	Lag
10	Carry out tender evaluation	FS	0d

ID	Successor Name	Type	Lag
12	Issue approved tender docs	FS	0d

ID	Name	Duration	Scheduled Start	Scheduled Finish

"Approval for tender evaluation" continued

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	40h	0h	9/20/95 8:00am	9/26/95 5:00pm
2	Project Co-ordinator	1	40h	0h	9/20/95 8:00am	9/26/95 5:00pm
3	Co-ordinator Architecture	1	40h	0h	9/20/95 8:00am	9/26/95 5:00pm
6	Co-ordinator Quantity Surveying	1	40h	0h	9/20/95 8:00am	9/26/95 5:00pm

12 Issue approved tender docs 2w 9/27/95 8:00am 10/10/95 5:00pm

ID	Predecessor Name	Type	Lag
11	Approval for tender evaluation	FS	0d

ID	Successor Name	Type	Lag
13	Handover site to contractor	SS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
2	Project Co-ordinator	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
3	Co-ordinator Architecture	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
6	Co-ordinator Quantity Surveying	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm

13 Handover site to contractor 2w 9/27/95 8:00am 10/10/95 5:00pm

ID	Predecessor Name	Type	Lag
12	Issue approved tender docs	SS	0d

ID	Successor Name	Type	Lag
14	Provide resident clerk of works	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
2	Project Co-ordinator	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
3	Co-ordinator Architecture	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
6	Co-ordinator Quantity Surveying	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm

14 Provide resident clerk of works 36w 10/11/95 8:00am 6/18/96 5:00pm

ID	Predecessor Name	Type	Lag
13	Handover site to contractor	FS	0d

ID	Successor Name	Type	Lag
15	Provide supervisory team	SS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
30	Clerk of Works	12	17280h	0h	10/11/95 8:00am	6/18/96 5:00pm

15 Provide supervisory team 36w 10/11/95 8:00am 6/18/96 5:00pm

ID	Predecessor Name	Type	Lag
14	Provide resident clerk of works	SS	0d

ID	Successor Name	Type	Lag
16	Commission and handover site	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
2	Project Co-ordinator	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
3	Co-ordinator Architecture	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
6	Co-ordinator Quantity Surveying	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
9	Architect 3	2	2880h	0h	10/11/95 8:00am	6/18/96 5:00pm
12	Civil/Structural Engr. 3	2	2880h	0h	10/11/95 8:00am	6/18/96 5:00pm
16	Elect./Mech. Engr. 3	2	2880h	0h	10/11/95 8:00am	6/18/96 5:00pm
19	Quantity Surveyor 3	2	2880h	0h	10/11/95 8:00am	6/18/96 5:00pm

16 Commission and handover site 12w 6/19/96 8:00am 9/10/96 5:00pm

ID	Predecessor Name	Type	Lag
15	Provide supervisory team	FS	0d

ID	Successor Name	Type	Lag
17	Provide as-built drawings	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
2	Project Co-ordinator	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
3	Co-ordinator Architecture	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
6	Co-ordinator Quantity Surveying	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm

17 Provide as-built drawings 16w 9/11/96 8:00am 12/31/96 5:00pm

ID	Predecessor Name	Type	Lag
16	Commission and handover site	FS	0d

ID	Successor Name	Type	Lag
18	Provide maintenance manual	SS	0d

ID	Name	Duration	Scheduled Start	Scheduled Finish

"Provide as-built drawings" continued

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
2	Project Co-ordinator	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
3	Co-ordinator Architecture	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
6	Co-ordinator Quantity Surveying	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
9	Architect 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
12	Civil/Structural Engr. 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
16	Elect./Mech. Engr. 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
19	Quantity Surveyor 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
31	Architectural Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
32	Civil/Structural Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
33	Elect./Mech. Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm

18 Provide maintenance manual 16w 9/11/96 8:00am 12/31/96 5:00pm

ID	Predecessor Name	Type	Lag
17	Provide as-built drawings	SS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
2	Project Co-ordinator	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
3	Co-ordinator Architecture	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
6	Co-ordinator Quantity Surveying	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
9	Architect 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
12	Civil/Structural Engr. 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
16	Elect./Mech. Engr. 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
19	Quantity Surveyor 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
31	Architectural Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
32	Civil/Structural Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
33	Elect./Mech. Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm

Sokoto Health Services Rehabilitation Project

ID	Name	Cost	Planned Cost	Variance
1	Partner In Charge	$654,000.00	$0.00	$654,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	1	$15,000.00	$0.00	$0.00	$15,000.00
3	Detail out needs in hospitals	1	$15,000.00	$0.00	$0.00	$15,000.00
5	Prepare preliminary drawings	1	$30,000.00	$0.00	$0.00	$30,000.00
6	Produce working drawings	1	$60,000.00	$0.00	$0.00	$60,000.00
7	Produce tender documents	1	$60,000.00	$0.00	$0.00	$60,000.00
9	Obtain ADF approvals and issue docs	1	$60,000.00	$0.00	$0.00	$60,000.00
10	Carry out tender evaluation	1	$7,500.00	$0.00	$0.00	$7,500.00
11	Approval for tender evaluation	1	$7,500.00	$0.00	$0.00	$7,500.00
13	Handover site to contractor	1	$15,000.00	$0.00	$0.00	$15,000.00
15	Provide supervisory team	1	$54,000.00	$0.00	$0.00	$54,000.00
16	Commission and handover site	1	$90,000.00	$0.00	$0.00	$90,000.00
17	Provide as-built drawings	1	$120,000.00	$0.00	$0.00	$120,000.00
18	Provide maintenance manual	1	$120,000.00	$0.00	$0.00	$120,000.00

ID	Name	Cost	Planned Cost	Variance
2	Project Co-ordinator	$545,000.00	$0.00	$545,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	1	$12,500.00	$0.00	$0.00	$12,500.00
3	Detail out needs in hospitals	1	$12,500.00	$0.00	$0.00	$12,500.00
6	Produce working drawings	1	$50,000.00	$0.00	$0.00	$50,000.00
7	Produce tender documents	1	$50,000.00	$0.00	$0.00	$50,000.00
8	Obtain PIU approvals	1	$12,500.00	$0.00	$0.00	$12,500.00
9	Obtain ADF approvals and issue docs	1	$50,000.00	$0.00	$0.00	$50,000.00
10	Carry out tender evaluation	1	$6,250.00	$0.00	$0.00	$6,250.00
11	Approval for tender evaluation	1	$6,250.00	$0.00	$0.00	$6,250.00
12	Issue approved tender docs	1	$12,500.00	$0.00	$0.00	$12,500.00
13	Handover site to contractor	1	$12,500.00	$0.00	$0.00	$12,500.00
15	Provide supervisory team	1	$45,000.00	$0.00	$0.00	$45,000.00
16	Commission and handover site	1	$75,000.00	$0.00	$0.00	$75,000.00
17	Provide as-built drawings	1	$100,000.00	$0.00	$0.00	$100,000.00
18	Provide maintenance manual	1	$100,000.00	$0.00	$0.00	$100,000.00

ID	Name	Cost	Planned Cost	Variance
3	Co-ordinator Architecture	$436,000.00	$0.00	$436,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
5	Prepare preliminary drawings	1	$20,000.00	$0.00	$0.00	$20,000.00
6	Produce working drawings	1	$40,000.00	$0.00	$0.00	$40,000.00
7	Produce tender documents	1	$40,000.00	$0.00	$0.00	$40,000.00
8	Obtain PIU approvals	1	$10,000.00	$0.00	$0.00	$10,000.00
9	Obtain ADF approvals and issue docs	1	$40,000.00	$0.00	$0.00	$40,000.00
10	Carry out tender evaluation	1	$5,000.00	$0.00	$0.00	$5,000.00
11	Approval for tender evaluation	1	$5,000.00	$0.00	$0.00	$5,000.00
12	Issue approved tender docs	1	$10,000.00	$0.00	$0.00	$10,000.00
13	Handover site to contractor	1	$10,000.00	$0.00	$0.00	$10,000.00
15	Provide supervisory team	1	$36,000.00	$0.00	$0.00	$36,000.00
16	Commission and handover site	1	$60,000.00	$0.00	$0.00	$60,000.00
17	Provide as-built drawings	1	$80,000.00	$0.00	$0.00	$80,000.00
18	Provide maintenance manual	1	$80,000.00	$0.00	$0.00	$80,000.00

ID	Name	Cost	Planned Cost	Variance
4	Co-ordinator Civil/Structural En	$376,000.00	$0.00	$376,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	1	$10,000.00	$0.00	$0.00	$10,000.00
3	Detail out needs in hospitals	1	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	1	$40,000.00	$0.00	$0.00	$40,000.00
8	Obtain PIU approvals	1	$10,000.00	$0.00	$0.00	$10,000.00
9	Obtain ADF approvals and issue docs	1	$40,000.00	$0.00	$0.00	$40,000.00
13	Handover site to contractor	1	$10,000.00	$0.00	$0.00	$10,000.00
15	Provide supervisory team	1	$36,000.00	$0.00	$0.00	$36,000.00
16	Commission and handover site	1	$60,000.00	$0.00	$0.00	$60,000.00
17	Provide as-built drawings	1	$80,000.00	$0.00	$0.00	$80,000.00
18	Provide maintenance manual	1	$80,000.00	$0.00	$0.00	$80,000.00

Sokoto Health Services Rehabilitation Project

ID	Name	Cost	Planned Cost	Variance
5	Co-ordinator Elect/Mech Eng.	$381,000.00	$0.00	$381,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	1	$10,000.00	$0.00	$0.00	$10,000.00
3	Detail out needs in hospitals	1	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	1	$40,000.00	$0.00	$0.00	$40,000.00
7	Produce tender documents	1	$40,000.00	$0.00	$0.00	$40,000.00
8	Obtain PIU approvals	1	$10,000.00	$0.00	$0.00	$10,000.00
10	Carry out tender evaluation	1	$5,000.00	$0.00	$0.00	$5,000.00
13	Handover site to contractor	1	$10,000.00	$0.00	$0.00	$10,000.00
15	Provide supervisory team	1	$36,000.00	$0.00	$0.00	$36,000.00
16	Commission and handover site	1	$60,000.00	$0.00	$0.00	$60,000.00
17	Provide as-built drawings	1	$80,000.00	$0.00	$0.00	$80,000.00
18	Provide maintenance manual	1	$80,000.00	$0.00	$0.00	$80,000.00

6	Co-ordinator Quantity Surveyin	$436,000.00	$0.00	$436,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
5	Prepare preliminary drawings	1	$20,000.00	$0.00	$0.00	$20,000.00
6	Produce working drawings	1	$40,000.00	$0.00	$0.00	$40,000.00
7	Produce tender documents	1	$40,000.00	$0.00	$0.00	$40,000.00
8	Obtain PIU approvals	1	$10,000.00	$0.00	$0.00	$10,000.00
9	Obtain ADF approvals and issue docs	1	$40,000.00	$0.00	$0.00	$40,000.00
10	Carry out tender evaluation	1	$5,000.00	$0.00	$0.00	$5,000.00
11	Approval for tender evaluation	1	$5,000.00	$0.00	$0.00	$5,000.00
12	Issue approved tender docs	1	$10,000.00	$0.00	$0.00	$10,000.00
13	Handover site to contractor	1	$10,000.00	$0.00	$0.00	$10,000.00
15	Provide supervisory team	1	$36,000.00	$0.00	$0.00	$36,000.00
16	Commission and handover site	1	$60,000.00	$0.00	$0.00	$60,000.00
17	Provide as-built drawings	1	$80,000.00	$0.00	$0.00	$80,000.00
18	Provide maintenance manual	1	$80,000.00	$0.00	$0.00	$80,000.00

7	Architect 1	$93,750.00	$0.00	$93,750.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	3	$7,500.00	$0.00	$0.00	$7,500.00
3	Detail out needs in hospitals	3	$7,500.00	$0.00	$0.00	$7,500.00
5	Prepare preliminary drawings	3	$15,000.00	$0.00	$0.00	$15,000.00
6	Produce working drawings	3	$30,000.00	$0.00	$0.00	$30,000.00
7	Produce tender documents	3	$30,000.00	$0.00	$0.00	$30,000.00
10	Carry out tender evaluation	3	$3,750.00	$0.00	$0.00	$3,750.00

8	Architect 2	$93,750.00	$0.00	$93,750.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	6	$7,500.00	$0.00	$0.00	$7,500.00
3	Detail out needs in hospitals	6	$7,500.00	$0.00	$0.00	$7,500.00
5	Prepare preliminary drawings	6	$15,000.00	$0.00	$0.00	$15,000.00
6	Produce working drawings	6	$30,000.00	$0.00	$0.00	$30,000.00
7	Produce tender documents	6	$30,000.00	$0.00	$0.00	$30,000.00
10	Carry out tender evaluation	6	$3,750.00	$0.00	$0.00	$3,750.00

9	Architect 3	$390,000.00	$0.00	$390,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
15	Provide supervisory team	2	$270,000.00	$0.00	$0.00	$270,000.00
17	Provide as-built drawings	2	$60,000.00	$0.00	$0.00	$60,000.00
18	Provide maintenance manual	2	$60,000.00	$0.00	$0.00	$60,000.00

10	Civil/Structural Eng 1	$90,000.00	$0.00	$90,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	2	$7,500.00	$0.00	$0.00	$7,500.00
3	Detail out needs in hospitals	2	$7,500.00	$0.00	$0.00	$7,500.00
5	Prepare preliminary drawings	2	$15,000.00	$0.00	$0.00	$15,000.00
6	Produce working drawings	2	$30,000.00	$0.00	$0.00	$30,000.00
7	Produce tender documents	2	$30,000.00	$0.00	$0.00	$30,000.00

11	Civil/Structural Engr. 2	$90,000.00	$0.00	$90,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	6	$7,500.00	$0.00	$0.00	$7,500.00

ID	Name	Cost	Planned Cost	Variance

"Civil/Structural Engr. 2" continued

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
3	Detail out needs in hospitals	6	$7,500.00	$0.00	$0.00	$7,500.00
5	Prepare preliminary drawings	6	$15,000.00	$0.00	$0.00	$15,000.00
6	Produce working drawings	6	$30,000.00	$0.00	$0.00	$30,000.00
7	Produce tender documents	6	$30,000.00	$0.00	$0.00	$30,000.00

12 Civil/Structural Engr. 3 $390,000.00 $0.00 $390,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
15	Provide supervisory team	2	$270,000.00	$0.00	$0.00	$270,000.00
17	Provide as-built drawings	2	$60,000.00	$0.00	$0.00	$60,000.00
18	Provide maintenance manual	2	$60,000.00	$0.00	$0.00	$60,000.00

13 Elect./Mech. Engr. 1 $93,750.00 $0.00 $93,750.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	2	$7,500.00	$0.00	$0.00	$7,500.00
3	Detail out needs in hospitals	2	$7,500.00	$0.00	$0.00	$7,500.00
5	Prepare preliminary drawings	2	$15,000.00	$0.00	$0.00	$15,000.00
6	Produce working drawings	2	$30,000.00	$0.00	$0.00	$30,000.00
7	Produce tender documents	2	$30,000.00	$0.00	$0.00	$30,000.00
10	Carry out tender evaluation	2	$3,750.00	$0.00	$0.00	$3,750.00

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15 Elect./Mech. Engr. 2 $93,750.00 $0.00 $93,750.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	6	$7,500.00	$0.00	$0.00	$7,500.00
3	Detail out needs in hospitals	6	$7,500.00	$0.00	$0.00	$7,500.00
5	Prepare preliminary drawings	6	$15,000.00	$0.00	$0.00	$15,000.00
6	Produce working drawings	6	$30,000.00	$0.00	$0.00	$30,000.00
7	Produce tender documents	6	$30,000.00	$0.00	$0.00	$30,000.00
10	Carry out tender evaluation	6	$3,750.00	$0.00	$0.00	$3,750.00

16 Elect./Mech. Engr. 3 $390,000.00 $0.00 $390,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
15	Provide supervisory team	2	$270,000.00	$0.00	$0.00	$270,000.00
17	Provide as-built drawings	2	$60,000.00	$0.00	$0.00	$60,000.00
18	Provide maintenance manual	2	$60,000.00	$0.00	$0.00	$60,000.00

17 Quantity Surveyor 1 $93,750.00 $0.00 $93,750.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	2	$7,500.00	$0.00	$0.00	$7,500.00
3	Detail out needs in hospitals	2	$7,500.00	$0.00	$0.00	$7,500.00
5	Prepare preliminary drawings	2	$15,000.00	$0.00	$0.00	$15,000.00
6	Produce working drawings	2	$30,000.00	$0.00	$0.00	$30,000.00
7	Produce tender documents	2	$30,000.00	$0.00	$0.00	$30,000.00
10	Carry out tender evaluation	2	$3,750.00	$0.00	$0.00	$3,750.00

18 Quanrtity Surveyor 2 $93,750.00 $0.00 $93,750.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	6	$7,500.00	$0.00	$0.00	$7,500.00
3	Detail out needs in hospitals	6	$7,500.00	$0.00	$0.00	$7,500.00
5	Prepare preliminary drawings	6	$15,000.00	$0.00	$0.00	$15,000.00
6	Produce working drawings	6	$30,000.00	$0.00	$0.00	$30,000.00
7	Produce tender documents	6	$30,000.00	$0.00	$0.00	$30,000.00
10	Carry out tender evaluation	6	$3,750.00	$0.00	$0.00	$3,750.00

19 Quantity Surveyor 3 $390,000.00 $0.00 $390,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
15	Provide supervisory team	2	$270,000.00	$0.00	$0.00	$270,000.00
17	Provide as-built drawings	2	$60,000.00	$0.00	$0.00	$60,000.00
18	Provide maintenance manual	2	$60,000.00	$0.00	$0.00	$60,000.00

20 Architectural Technician 1 $60,000.00 $0.00 $60,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	6	$5,000.00	$0.00	$0.00	$5,000.00
3	Detail out needs in hospitals	6	$5,000.00	$0.00	$0.00	$5,000.00

ID	Name	Cost	Planned Cost	Variance

"Architectural Technician 1" continued

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
5	Prepare preliminary drawings	6	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	6	$20,000.00	$0.00	$0.00	$20,000.00
7	Produce tender documents	6	$20,000.00	$0.00	$0.00	$20,000.00

21 Architectural Technician 2 $60,000.00 $0.00 $60,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	12	$5,000.00	$0.00	$0.00	$5,000.00
3	Detail out needs in hospitals	12	$5,000.00	$0.00	$0.00	$5,000.00
5	Prepare preliminary drawings	12	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	12	$20,000.00	$0.00	$0.00	$20,000.00
7	Produce tender documents	12	$20,000.00	$0.00	$0.00	$20,000.00

22 Civil/Structural Technician 1 $60,000.00 $0.00 $60,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	4	$5,000.00	$0.00	$0.00	$5,000.00
3	Detail out needs in hospitals	4	$5,000.00	$0.00	$0.00	$5,000.00
5	Prepare preliminary drawings	4	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	4	$20,000.00	$0.00	$0.00	$20,000.00
7	Produce tender documents	4	$20,000.00	$0.00	$0.00	$20,000.00

23 Civil/Structural Technician 2 $60,000.00 $0.00 $60,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	9	$5,000.00	$0.00	$0.00	$5,000.00
3	Detail out needs in hospitals	9	$5,000.00	$0.00	$0.00	$5,000.00
5	Prepare preliminary drawings	9	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	9	$20,000.00	$0.00	$0.00	$20,000.00
7	Produce tender documents	9	$20,000.00	$0.00	$0.00	$20,000.00

24 Elect./Mech. Technician 1 $60,000.00 $0.00 $60,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	4	$5,000.00	$0.00	$0.00	$5,000.00
3	Detail out needs in hospitals	4	$5,000.00	$0.00	$0.00	$5,000.00
5	Prepare preliminary drawings	4	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	4	$20,000.00	$0.00	$0.00	$20,000.00
7	Produce tender documents	4	$20,000.00	$0.00	$0.00	$20,000.00

25 Elect./Mech. Technician 2 $60,000.00 $0.00 $60,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	9	$5,000.00	$0.00	$0.00	$5,000.00
3	Detail out needs in hospitals	9	$5,000.00	$0.00	$0.00	$5,000.00
5	Prepare preliminary drawings	9	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	9	$20,000.00	$0.00	$0.00	$20,000.00
7	Produce tender documents	9	$20,000.00	$0.00	$0.00	$20,000.00

26 Quantity Surveying Assistant $60,000.00 $0.00 $60,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	4	$5,000.00	$0.00	$0.00	$5,000.00
3	Detail out needs in hospitals	4	$5,000.00	$0.00	$0.00	$5,000.00
5	Prepare preliminary drawings	4	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	4	$20,000.00	$0.00	$0.00	$20,000.00
7	Produce tender documents	4	$20,000.00	$0.00	$0.00	$20,000.00

27 Quantity Surveying Assistant $60,000.00 $0.00 $60,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	9	$5,000.00	$0.00	$0.00	$5,000.00
3	Detail out needs in hospitals	9	$5,000.00	$0.00	$0.00	$5,000.00
5	Prepare preliminary drawings	9	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	9	$20,000.00	$0.00	$0.00	$20,000.00
7	Produce tender documents	9	$20,000.00	$0.00	$0.00	$20,000.00

28 Land Surveyor $97,500.00 $0.00 $97,500.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	5	$7,500.00	$0.00	$0.00	$7,500.00
3	Detail out needs in hospitals	5	$7,500.00	$0.00	$0.00	$7,500.00

ID	Name	Cost	Planned Cost	Variance

"Land Surveyor" continued

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
4	Survey each hospital	5	$37,500.00	$0.00	$0.00	$37,500.00
5	Prepare preliminary drawings	5	$15,000.00	$0.00	$0.00	$15,000.00
6	Produce working drawings	5	$30,000.00	$0.00	$0.00	$30,000.00

29	Land Surveyors Assistant	$45,000.00	$0.00	$45,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Visit each hospital	10	$5,000.00	$0.00	$0.00	$5,000.00
3	Detail out needs in hospitals	10	$5,000.00	$0.00	$0.00	$5,000.00
4	Survey each hospital	10	$5,000.00	$0.00	$0.00	$5,000.00
5	Prepare preliminary drawings	10	$10,000.00	$0.00	$0.00	$10,000.00
6	Produce working drawings	10	$20,000.00	$0.00	$0.00	$20,000.00

30	Clerk of Works	$1,080,000.00	$0.00	$1,080,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
14	Provide resident clerk of works	12	$1,080,000.00	$0.00	$0.00	$1,080,000.00

31	Architectural Technician 3	$80,000.00	$0.00	$80,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
17	Provide as-built drawings	2	$40,000.00	$0.00	$0.00	$40,000.00
18	Provide maintenance manual	2	$40,000.00	$0.00	$0.00	$40,000.00

32	Civil/Structural Technician 3	$80,000.00	$0.00	$80,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
17	Provide as-built drawings	2	$40,000.00	$0.00	$0.00	$40,000.00
18	Provide maintenance manual	2	$40,000.00	$0.00	$0.00	$40,000.00

33	Elect./Mech. Technician 3	$80,000.00	$0.00	$80,000.00

ID	Task Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
17	Provide as-built drawings	2	$40,000.00	$0.00	$0.00	$40,000.00
18	Provide maintenance manual	2	$40,000.00	$0.00	$0.00	$40,000.00

34	Co-ordinator Elect./Mech. Eng.	$0.00	$0.00	$0.00
		$7,073,000.00	$0.00	$7,073,000.00

Sokoto Health Services Rehabilitation Project

ID	Name	Fixed Cost	Total Cost	Planned
1	Start Project	$0.00	$0.00	$0.00

ID	Successor Name	Type	Lag
2	Visit each hospital	FS	0d

ID	Name	Fixed Cost	Total Cost	Planned
2	Visit each hospital	$0.00	$160,000.00	$0.00

ID	Predecessor Name	Type	Lag
1	Start Project	FS	0d

ID	Successor Name	Type	Lag
3	Detail out needs in hospitals	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	80h	0h	2/1/95 8:00am	2/14/95 5:00pm
2	Project Co-ordinator	1	80h	0h	2/1/95 8:00am	2/14/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	80h	0h	2/1/95 8:00am	2/14/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	80h	0h	2/1/95 8:00am	2/14/95 5:00pm
7	Architect 1	3	80h	0h	2/1/95 8:00am	2/6/95 10:40am
8	Architect 2	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
10	Civil/Structural Eng 1	2	80h	0h	2/1/95 8:00am	2/7/95 5:00pm
11	Civil/Structural Engr. 2	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
13	Elect./Mech. Engr. 1	2	80h	0h	2/1/95 8:00am	2/7/95 5:00pm
15	Elect./Mech. Engr. 2	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
17	Quantity Surveyor 1	2	80h	0h	2/1/95 8:00am	2/7/95 5:00pm
18	Quanrtity Surveyor 2	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
20	Architectural Technician 1	6	80h	0h	2/1/95 8:00am	2/2/95 2:20pm
21	Architectural Technician 2	12	80h	0h	2/1/95 8:00am	2/1/95 3:40pm
22	Civil/Structural Technician 1	4	80h	0h	2/1/95 8:00am	2/3/95 12:00pm
23	Civil/Structural Technician 2	9	80h	0h	2/1/95 8:00am	2/2/95 8:53am
24	Elect./Mech. Technician 1	4	80h	0h	2/1/95 8:00am	2/3/95 12:00pm
25	Elect./Mech. Technician 2	9	80h	0h	2/1/95 8:00am	2/2/95 8:53am
26	Quantity Surveying Assistant 1	4	80h	0h	2/1/95 8:00am	2/3/95 12:00pm
27	Quantity Surveying Assistant 2	9	80h	0h	2/1/95 8:00am	2/2/95 8:53am
28	Land Surveyor	5	80h	0h	2/1/95 8:00am	2/2/95 5:00pm
29	Land Surveyors Assistant	10	80h	0h	2/1/95 8:00am	2/1/95 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$15,000.00	$0.00	$0.00	$15,000.00
2	Project Co-ordinator	1	$12,500.00	$0.00	$0.00	$12,500.00
4	Co-ordinator Civil/Structural Eng.	1	$10,000.00	$0.00	$0.00	$10,000.00
5	Co-ordinator Elect/Mech Eng.	1	$10,000.00	$0.00	$0.00	$10,000.00
7	Architect 1	3	$7,500.00	$0.00	$0.00	$7,500.00
8	Architect 2	6	$7,500.00	$0.00	$0.00	$7,500.00
10	Civil/Structural Eng 1	2	$7,500.00	$0.00	$0.00	$7,500.00
11	Civil/Structural Engr. 2	6	$7,500.00	$0.00	$0.00	$7,500.00
13	Elect./Mech. Engr. 1	2	$7,500.00	$0.00	$0.00	$7,500.00
15	Elect./Mech. Engr. 2	6	$7,500.00	$0.00	$0.00	$7,500.00
17	Quantity Surveyor 1	2	$7,500.00	$0.00	$0.00	$7,500.00
18	Quanrtity Surveyor 2	6	$7,500.00	$0.00	$0.00	$7,500.00
20	Architectural Technician 1	6	$5,000.00	$0.00	$0.00	$5,000.00
21	Architectural Technician 2	12	$5,000.00	$0.00	$0.00	$5,000.00
22	Civil/Structural Technician 1	4	$5,000.00	$0.00	$0.00	$5,000.00
23	Civil/Structural Technician 2	9	$5,000.00	$0.00	$0.00	$5,000.00
24	Elect./Mech. Technician 1	4	$5,000.00	$0.00	$0.00	$5,000.00
25	Elect./Mech. Technician 2	9	$5,000.00	$0.00	$0.00	$5,000.00
26	Quantity Surveying Assistant 1	4	$5,000.00	$0.00	$0.00	$5,000.00
27	Quantity Surveying Assistant 2	9	$5,000.00	$0.00	$0.00	$5,000.00
28	Land Surveyor	5	$7,500.00	$0.00	$0.00	$7,500.00
29	Land Surveyors Assistant	10	$5,000.00	$0.00	$0.00	$5,000.00

ID	Name	Fixed Cost	Total Cost	Planned
3	Detail out needs in hospitals	$0.00	$160,000.00	$0.00

ID	Predecessor Name	Type	Lag
2	Visit each hospital	FS	0d

ID	Successor Name	Type	Lag
4	Survey each hospital	SS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	80h	0h	2/15/95 8:00am	2/28/95 5:00pm
2	Project Co-ordinator	1	80h	0h	2/15/95 8:00am	2/28/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	80h	0h	2/15/95 8:00am	2/28/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	80h	0h	2/15/95 8:00am	2/28/95 5:00pm

ID	Name	Fixed Cost	Total Cost	Planned

"Detail out needs in hospitals" continued

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
7	Architect 1	3	80h	0h	2/15/95 8:00am	2/20/95 10:40am
8	Architect 2	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
10	Civil/Structural Eng 1	2	80h	0h	2/15/95 8:00am	2/21/95 5:00pm
11	Civil/Structural Engr. 2	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
13	Elect./Mech. Engr. 1	2	80h	0h	2/15/95 8:00am	2/21/95 5:00pm
15	Elect./Mech. Engr. 2	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
17	Quantity Surveyor 1	2	80h	0h	2/15/95 8:00am	2/21/95 5:00pm
18	Quanrtity Surveyor 2	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
20	Architectural Technician 1	6	80h	0h	2/15/95 8:00am	2/16/95 2:20pm
21	Architectural Technician 2	12	80h	0h	2/15/95 8:00am	2/15/95 3:40pm
22	Civil/Structural Technician 1	4	80h	0h	2/15/95 8:00am	2/17/95 12:00pm
23	Civil/Structural Technician 2	9	80h	0h	2/15/95 8:00am	2/16/95 8:53am
24	Elect./Mech. Technician 1	4	80h	0h	2/15/95 8:00am	2/17/95 12:00pm
25	Elect./Mech. Technician 2	9	80h	0h	2/15/95 8:00am	2/16/95 8:53am
26	Quantity Surveying Assistant 1	4	80h	0h	2/15/95 8:00am	2/17/95 12:00pm
27	Quantity Surveying Assistant 2	9	80h	0h	2/15/95 8:00am	2/16/95 8:53am
28	Land Surveyor	5	80h	0h	2/15/95 8:00am	2/16/95 5:00pm
29	Land Surveyors Assistant	10	80h	0h	2/15/95 8:00am	2/15/95 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$15,000.00	$0.00	$0.00	$15,000.00
2	Project Co-ordinator	1	$12,500.00	$0.00	$0.00	$12,500.00
4	Co-ordinator Civil/Structural Eng.	1	$10,000.00	$0.00	$0.00	$10,000.00
5	Co-ordinator Elect/Mech Eng.	1	$10,000.00	$0.00	$0.00	$10,000.00
7	Architect 1	3	$7,500.00	$0.00	$0.00	$7,500.00
8	Architect 2	6	$7,500.00	$0.00	$0.00	$7,500.00
10	Civil/Structural Eng 1	2	$7,500.00	$0.00	$0.00	$7,500.00
11	Civil/Structural Engr. 2	6	$7,500.00	$0.00	$0.00	$7,500.00
13	Elect./Mech. Engr. 1	2	$7,500.00	$0.00	$0.00	$7,500.00
15	Elect./Mech. Engr. 2	6	$7,500.00	$0.00	$0.00	$7,500.00
17	Quantity Surveyor 1	2	$7,500.00	$0.00	$0.00	$7,500.00
18	Quanrtity Surveyor 2	6	$7,500.00	$0.00	$0.00	$7,500.00
20	Architectural Technician 1	6	$5,000.00	$0.00	$0.00	$5,000.00
21	Architectural Technician 2	12	$5,000.00	$0.00	$0.00	$5,000.00
22	Civil/Structural Technician 1	4	$5,000.00	$0.00	$0.00	$5,000.00
23	Civil/Structural Technician 2	9	$5,000.00	$0.00	$0.00	$5,000.00
24	Elect./Mech. Technician 1	4	$5,000.00	$0.00	$0.00	$5,000.00
25	Elect./Mech. Technician 2	9	$5,000.00	$0.00	$0.00	$5,000.00
26	Quantity Surveying Assistant 1	4	$5,000.00	$0.00	$0.00	$5,000.00
27	Quantity Surveying Assistant 2	9	$5,000.00	$0.00	$0.00	$5,000.00
28	Land Surveyor	5	$7,500.00	$0.00	$0.00	$7,500.00
29	Land Surveyors Assistant	10	$5,000.00	$0.00	$0.00	$5,000.00

4 Survey each hospital — $0.00 — $42,500.00 — $0.00

ID	Predecessor Name	Type	Lag
3	Detail out needs in hospitals	SS	0d

ID	Successor Name	Type	Lag
5	Prepare preliminary drawings	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
28	Land Surveyor	5	400h	0h	2/15/95 8:00am	2/28/95 5:00pm
29	Land Surveyors Assistant	10	80h	0h	2/15/95 8:00am	2/15/95 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
28	Land Surveyor	5	$37,500.00	$0.00	$0.00	$37,500.00
29	Land Surveyors Assistant	10	$5,000.00	$0.00	$0.00	$5,000.00

5 Prepare preliminary drawings — $0.00 — $295,000.00 — $0.00

ID	Predecessor Name	Type	Lag
4	Survey each hospital	FS	0d

ID	Successor Name	Type	Lag
6	Produce working drawings	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	160h	0h	3/1/95 8:00am	3/28/95 5:00pm
3	Co-ordinator Architecture	1	160h	0h	3/1/95 8:00am	3/28/95 5:00pm
6	Co-ordinator Quantity Surveying	1	160h	0h	3/1/95 8:00am	3/28/95 5:00pm

ID	Name	Fixed Cost	Total Cost	Planned

"Prepare preliminary drawings" continued

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
7	Architect 1	3	160h	0h	3/1/95 8:00am	3/9/95 2:20pm
8	Architect 2	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
10	Civil/Structural Eng 1	2	160h	0h	3/1/95 8:00am	3/14/95 5:00pm
11	Civil/Structural Engr. 2	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
13	Elect./Mech. Engr. 1	2	160h	0h	3/1/95 8:00am	3/14/95 5:00pm
15	Elect./Mech. Engr. 2	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
17	Quantity Surveyor 1	2	160h	0h	3/1/95 8:00am	3/14/95 5:00pm
18	Quanrtity Surveyor 2	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
20	Architectural Technician 1	6	160h	0h	3/1/95 8:00am	3/6/95 10:40am
21	Architectural Technician 2	12	160h	0h	3/1/95 8:00am	3/2/95 2:20pm
22	Civil/Structural Technician 1	4	160h	0h	3/1/95 8:00am	3/7/95 5:00pm
23	Civil/Structural Technician 2	9	160h	0h	3/1/95 8:00am	3/3/95 9:47am
24	Elect./Mech. Technician 1	4	160h	0h	3/1/95 8:00am	3/7/95 5:00pm
25	Elect./Mech. Technician 2	9	160h	0h	3/1/95 8:00am	3/3/95 9:47am
26	Quantity Surveying Assistant 1	4	160h	0h	3/1/95 8:00am	3/7/95 5:00pm
27	Quantity Surveying Assistant 2	9	160h	0h	3/1/95 8:00am	3/3/95 9:47am
28	Land Surveyor	5	160h	0h	3/1/95 8:00am	3/6/95 5:00pm
29	Land Surveyors Assistant	10	160h	0h	3/1/95 8:00am	3/2/95 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$30,000.00	$0.00	$0.00	$30,000.00
3	Co-ordinator Architecture	1	$20,000.00	$0.00	$0.00	$20,000.00
6	Co-ordinator Quantity Surveying	1	$20,000.00	$0.00	$0.00	$20,000.00
7	Architect 1	3	$15,000.00	$0.00	$0.00	$15,000.00
8	Architect 2	6	$15,000.00	$0.00	$0.00	$15,000.00
10	Civil/Structural Eng 1	2	$15,000.00	$0.00	$0.00	$15,000.00
11	Civil/Structural Engr. 2	6	$15,000.00	$0.00	$0.00	$15,000.00
13	Elect./Mech. Engr. 1	2	$15,000.00	$0.00	$0.00	$15,000.00
15	Elect./Mech. Engr. 2	6	$15,000.00	$0.00	$0.00	$15,000.00
17	Quantity Surveyor 1	2	$15,000.00	$0.00	$0.00	$15,000.00
18	Quanrtity Surveyor 2	6	$15,000.00	$0.00	$0.00	$15,000.00
20	Architectural Technician 1	6	$10,000.00	$0.00	$0.00	$10,000.00
21	Architectural Technician 2	12	$10,000.00	$0.00	$0.00	$10,000.00
22	Civil/Structural Technician 1	4	$10,000.00	$0.00	$0.00	$10,000.00
23	Civil/Structural Technician 2	9	$10,000.00	$0.00	$0.00	$10,000.00
24	Elect./Mech. Technician 1	4	$10,000.00	$0.00	$0.00	$10,000.00
25	Elect./Mech. Technician 2	9	$10,000.00	$0.00	$0.00	$10,000.00
26	Quantity Surveying Assistant 1	4	$10,000.00	$0.00	$0.00	$10,000.00
27	Quantity Surveying Assistant 2	9	$10,000.00	$0.00	$0.00	$10,000.00
28	Land Surveyor	5	$15,000.00	$0.00	$0.00	$15,000.00
29	Land Surveyors Assistant	10	$10,000.00	$0.00	$0.00	$10,000.00

6	Produce working drawings	$0.00	$720,000.00	$0.00

ID	Predecessor Name	Type	Lag
5	Prepare preliminary drawings	FS	0d

ID	Successor Name	Type	Lag
7	Produce tender documents	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
2	Project Co-ordinator	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
3	Co-ordinator Architecture	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
6	Co-ordinator Quantity Surveying	1	320h	0h	3/29/95 8:00am	5/23/95 5:00pm
7	Architect 1	3	320h	0h	3/29/95 8:00am	4/17/95 10:40am
8	Architect 2	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm
10	Civil/Structural Eng 1	2	320h	0h	3/29/95 8:00am	4/25/95 5:00pm
11	Civil/Structural Engr. 2	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm
13	Elect./Mech. Engr. 1	2	320h	0h	3/29/95 8:00am	4/25/95 5:00pm
15	Elect./Mech. Engr. 2	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm
17	Quantity Surveyor 1	2	320h	0h	3/29/95 8:00am	4/25/95 5:00pm
18	Quanrtity Surveyor 2	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm
20	Architectural Technician 1	6	320h	0h	3/29/95 8:00am	4/6/95 2:20pm

ID	Name	Fixed Cost	Total Cost	Planned

"Produce working drawings" continued

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
21	Architectural Technician 2	12	320h	0h	3/29/95 8:00am	4/3/95 10:40am
22	Civil/Structural Technician 1	4	320h	0h	3/29/95 8:00am	4/11/95 5:00pm
23	Civil/Structural Technician 2	9	320h	0h	3/29/95 8:00am	4/4/95 11:33am
24	Elect./Mech. Technician 1	4	320h	0h	3/29/95 8:00am	4/11/95 5:00pm
25	Elect./Mech. Technician 2	9	320h	0h	3/29/95 8:00am	4/4/95 11:33am
26	Quantity Surveying Assistant 1	4	320h	0h	3/29/95 8:00am	4/11/95 5:00pm
27	Quantity Surveying Assistant 2	9	320h	0h	3/29/95 8:00am	4/4/95 11:33am
28	Land Surveyor	5	320h	0h	3/29/95 8:00am	4/7/95 5:00pm
29	Land Surveyors Assistant	10	320h	0h	3/29/95 8:00am	4/3/95 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$60,000.00	$0.00	$0.00	$60,000.00
2	Project Co-ordinator	1	$50,000.00	$0.00	$0.00	$50,000.00
3	Co-ordinator Architecture	1	$40,000.00	$0.00	$0.00	$40,000.00
4	Co-ordinator Civil/Structural Eng.	1	$40,000.00	$0.00	$0.00	$40,000.00
5	Co-ordinator Elect/Mech Eng.	1	$40,000.00	$0.00	$0.00	$40,000.00
6	Co-ordinator Quantity Surveying	1	$40,000.00	$0.00	$0.00	$40,000.00
7	Architect 1	3	$30,000.00	$0.00	$0.00	$30,000.00
8	Architect 2	6	$30,000.00	$0.00	$0.00	$30,000.00
10	Civil/Structural Eng 1	2	$30,000.00	$0.00	$0.00	$30,000.00
11	Civil/Structural Engr. 2	6	$30,000.00	$0.00	$0.00	$30,000.00
13	Elect./Mech. Engr. 1	2	$30,000.00	$0.00	$0.00	$30,000.00
15	Elect./Mech. Engr. 2	6	$30,000.00	$0.00	$0.00	$30,000.00
17	Quantity Surveyor 1	2	$30,000.00	$0.00	$0.00	$30,000.00
18	Quanrtity Surveyor 2	6	$30,000.00	$0.00	$0.00	$30,000.00
20	Architectural Technician 1	6	$20,000.00	$0.00	$0.00	$20,000.00
21	Architectural Technician 2	12	$20,000.00	$0.00	$0.00	$20,000.00
22	Civil/Structural Technician 1	4	$20,000.00	$0.00	$0.00	$20,000.00
23	Civil/Structural Technician 2	9	$20,000.00	$0.00	$0.00	$20,000.00
24	Elect./Mech. Technician 1	4	$20,000.00	$0.00	$0.00	$20,000.00
25	Elect./Mech. Technician 2	9	$20,000.00	$0.00	$0.00	$20,000.00
26	Quantity Surveying Assistant 1	4	$20,000.00	$0.00	$0.00	$20,000.00
27	Quantity Surveying Assistant 2	9	$20,000.00	$0.00	$0.00	$20,000.00
28	Land Surveyor	5	$30,000.00	$0.00	$0.00	$30,000.00
29	Land Surveyors Assistant	10	$20,000.00	$0.00	$0.00	$20,000.00

7 Produce tender documents $0.00 $630,000.00 $0.00

ID	Predecessor Name	Type	Lag
6	Produce working drawings	FS	0d

ID	Successor Name	Type	Lag
8	Obtain PIU approvals	FF	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
2	Project Co-ordinator	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
3	Co-ordinator Architecture	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
6	Co-ordinator Quantity Surveying	1	320h	0h	5/24/95 8:00am	7/18/95 5:00pm
7	Architect 1	3	320h	0h	5/24/95 8:00am	6/12/95 10:40am
8	Architect 2	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
10	Civil/Structural Eng 1	2	320h	0h	5/24/95 8:00am	6/20/95 5:00pm
11	Civil/Structural Engr. 2	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
13	Elect./Mech. Engr. 1	2	320h	0h	5/24/95 8:00am	6/20/95 5:00pm
15	Elect./Mech. Engr. 2	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
17	Quantity Surveyor 1	2	320h	0h	5/24/95 8:00am	6/20/95 5:00pm
18	Quanrtity Surveyor 2	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
20	Architectural Technician 1	6	320h	0h	5/24/95 8:00am	6/1/95 2:20pm
21	Architectural Technician 2	12	320h	0h	5/24/95 8:00am	5/29/95 10:40am
22	Civil/Structural Technician 1	4	320h	0h	5/24/95 8:00am	6/6/95 5:00pm
23	Civil/Structural Technician 2	9	320h	0h	5/24/95 8:00am	5/30/95 11:33am
24	Elect./Mech. Technician 1	4	320h	0h	5/24/95 8:00am	6/6/95 5:00pm
25	Elect./Mech. Technician 2	9	320h	0h	5/24/95 8:00am	5/30/95 11:33am
26	Quantity Surveying Assistant 1	4	320h	0h	5/24/95 8:00am	6/6/95 5:00pm
27	Quantity Surveying Assistant 2	9	320h	0h	5/24/95 8:00am	5/30/95 11:33am

ID	Name	Fixed Cost	Total Cost	Planned

"Produce tender documents" continued

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$60,000.00	$0.00	$0.00	$60,000.00
2	Project Co-ordinator	1	$50,000.00	$0.00	$0.00	$50,000.00
3	Co-ordinator Architecture	1	$40,000.00	$0.00	$0.00	$40,000.00
5	Co-ordinator Elect/Mech Eng.	1	$40,000.00	$0.00	$0.00	$40,000.00
6	Co-ordinator Quantity Surveying	1	$40,000.00	$0.00	$0.00	$40,000.00
7	Architect 1	3	$30,000.00	$0.00	$0.00	$30,000.00
8	Architect 2	6	$30,000.00	$0.00	$0.00	$30,000.00
10	Civil/Structural Eng 1	2	$30,000.00	$0.00	$0.00	$30,000.00
11	Civil/Structural Engr. 2	6	$30,000.00	$0.00	$0.00	$30,000.00
13	Elect./Mech. Engr. 1	2	$30,000.00	$0.00	$0.00	$30,000.00
15	Elect./Mech. Engr. 2	6	$30,000.00	$0.00	$0.00	$30,000.00
17	Quantity Surveyor 1	2	$30,000.00	$0.00	$0.00	$30,000.00
18	Quanrtity Surveyor 2	6	$30,000.00	$0.00	$0.00	$30,000.00
20	Architectural Technician 1	6	$20,000.00	$0.00	$0.00	$20,000.00
21	Architectural Technician 2	12	$20,000.00	$0.00	$0.00	$20,000.00
22	Civil/Structural Technician 1	4	$20,000.00	$0.00	$0.00	$20,000.00
23	Civil/Structural Technician 2	9	$20,000.00	$0.00	$0.00	$20,000.00
24	Elect./Mech. Technician 1	4	$20,000.00	$0.00	$0.00	$20,000.00
25	Elect./Mech. Technician 2	9	$20,000.00	$0.00	$0.00	$20,000.00
26	Quantity Surveying Assistant 1	4	$20,000.00	$0.00	$0.00	$20,000.00
27	Quantity Surveying Assistant 2	9	$20,000.00	$0.00	$0.00	$20,000.00

8 Obtain PIU approvals $0.00 $52,500.00 $0.00

ID	Predecessor Name	Type	Lag
7	Produce tender documents	FF	0d

ID	Successor Name	Type	Lag
9	Obtain ADF approvals and issue docs	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
2	Project Co-ordinator	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm
3	Co-ordinator Architecture	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm
6	Co-ordinator Quantity Surveying	1	80h	0h	7/5/95 8:00am	7/18/95 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Project Co-ordinator	1	$12,500.00	$0.00	$0.00	$12,500.00
3	Co-ordinator Architecture	1	$10,000.00	$0.00	$0.00	$10,000.00
4	Co-ordinator Civil/Structural Eng.	1	$10,000.00	$0.00	$0.00	$10,000.00
5	Co-ordinator Elect/Mech Eng.	1	$10,000.00	$0.00	$0.00	$10,000.00
6	Co-ordinator Quantity Surveying	1	$10,000.00	$0.00	$0.00	$10,000.00

9 Obtain ADF approvals and issue $0.00 $230,000.00 $0.00

ID	Predecessor Name	Type	Lag
8	Obtain PIU approvals	FS	0d

ID	Successor Name	Type	Lag
10	Carry out tender evaluation	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm
2	Project Co-ordinator	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm
3	Co-ordinator Architecture	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm
6	Co-ordinator Quantity Surveying	1	320h	0h	7/19/95 8:00am	9/12/95 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$60,000.00	$0.00	$0.00	$60,000.00
2	Project Co-ordinator	1	$50,000.00	$0.00	$0.00	$50,000.00
3	Co-ordinator Architecture	1	$40,000.00	$0.00	$0.00	$40,000.00
4	Co-ordinator Civil/Structural Eng.	1	$40,000.00	$0.00	$0.00	$40,000.00
6	Co-ordinator Quantity Surveying	1	$40,000.00	$0.00	$0.00	$40,000.00

10 Carry out tender evaluation $0.00 $51,250.00 $0.00

ID	Predecessor Name	Type	Lag
9	Obtain ADF approvals and issue docs	FS	0d

ID	Successor Name	Type	Lag
11	Approval for tender evaluation	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm

ID	Name	Fixed Cost	Total Cost	Planned

"Carry out tender evaluation" continued

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
2	Project Co-ordinator	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm
3	Co-ordinator Architecture	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm
6	Co-ordinator Quantity Surveying	1	40h	0h	9/13/95 8:00am	9/19/95 5:00pm
7	Architect 1	3	40h	0h	9/13/95 8:00am	9/14/95 2:20pm
8	Architect 2	6	40h	0h	9/13/95 8:00am	9/13/95 3:40pm
13	Elect./Mech. Engr. 1	2	40h	0h	9/13/95 8:00am	9/15/95 12:00pm
15	Elect./Mech. Engr. 2	6	40h	0h	9/13/95 8:00am	9/13/95 3:40pm
17	Quantity Surveyor 1	2	40h	0h	9/13/95 8:00am	9/15/95 12:00pm
18	Quanrtity Surveyor 2	6	40h	0h	9/13/95 8:00am	9/13/95 3:40pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$7,500.00	$0.00	$0.00	$7,500.00
2	Project Co-ordinator	1	$6,250.00	$0.00	$0.00	$6,250.00
3	Co-ordinator Architecture	1	$5,000.00	$0.00	$0.00	$5,000.00
5	Co-ordinator Elect/Mech Eng.	1	$5,000.00	$0.00	$0.00	$5,000.00
6	Co-ordinator Quantity Surveying	1	$5,000.00	$0.00	$0.00	$5,000.00
7	Architect 1	3	$3,750.00	$0.00	$0.00	$3,750.00
8	Architect 2	6	$3,750.00	$0.00	$0.00	$3,750.00
13	Elect./Mech. Engr. 1	2	$3,750.00	$0.00	$0.00	$3,750.00
15	Elect./Mech. Engr. 2	6	$3,750.00	$0.00	$0.00	$3,750.00
17	Quantity Surveyor 1	2	$3,750.00	$0.00	$0.00	$3,750.00
18	Quanrtity Surveyor 2	6	$3,750.00	$0.00	$0.00	$3,750.00

11 Approval for tender evaluation $0.00 $23,750.00 $0.00

ID	Predecessor Name	Type	Lag
10	Carry out tender evaluation	FS	0d

ID	Successor Name	Type	Lag
12	Issue approved tender docs	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	40h	0h	9/20/95 8:00am	9/26/95 5:00pm
2	Project Co-ordinator	1	40h	0h	9/20/95 8:00am	9/26/95 5:00pm
3	Co-ordinator Architecture	1	40h	0h	9/20/95 8:00am	9/26/95 5:00pm
6	Co-ordinator Quantity Surveying	1	40h	0h	9/20/95 8:00am	9/26/95 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$7,500.00	$0.00	$0.00	$7,500.00
2	Project Co-ordinator	1	$6,250.00	$0.00	$0.00	$6,250.00
3	Co-ordinator Architecture	1	$5,000.00	$0.00	$0.00	$5,000.00
6	Co-ordinator Quantity Surveying	1	$5,000.00	$0.00	$0.00	$5,000.00

12 Issue approved tender docs $0.00 $32,500.00 $0.00

ID	Predecessor Name	Type	Lag
11	Approval for tender evaluation	FS	0d

ID	Successor Name	Type	Lag
13	Handover site to contractor	SS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
2	Project Co-ordinator	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
3	Co-ordinator Architecture	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
6	Co-ordinator Quantity Surveying	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
2	Project Co-ordinator	1	$12,500.00	$0.00	$0.00	$12,500.00
3	Co-ordinator Architecture	1	$10,000.00	$0.00	$0.00	$10,000.00
6	Co-ordinator Quantity Surveying	1	$10,000.00	$0.00	$0.00	$10,000.00

13 Handover site to contractor $0.00 $67,500.00 $0.00

ID	Predecessor Name	Type	Lag
12	Issue approved tender docs	SS	0d

ID	Successor Name	Type	Lag
14	Provide resident clerk of works	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
2	Project Co-ordinator	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
3	Co-ordinator Architecture	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm
6	Co-ordinator Quantity Surveying	1	80h	0h	9/27/95 8:00am	10/10/95 5:00pm

ID	Name	Fixed Cost	Total Cost	Planned

"Handover site to contractor" continued

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$15,000.00	$0.00	$0.00	$15,000.00
2	Project Co-ordinator	1	$12,500.00	$0.00	$0.00	$12,500.00
3	Co-ordinator Architecture	1	$10,000.00	$0.00	$0.00	$10,000.00
4	Co-ordinator Civil/Structural Eng.	1	$10,000.00	$0.00	$0.00	$10,000.00
5	Co-ordinator Elect/Mech Eng.	1	$10,000.00	$0.00	$0.00	$10,000.00
6	Co-ordinator Quantity Surveying	1	$10,000.00	$0.00	$0.00	$10,000.00

14 Provide resident clerk of works $0.00 $1,080,000.00 $0.00

ID	Predecessor Name	Type	Lag
13	Handover site to contractor	FS	0d

ID	Successor Name	Type	Lag
15	Provide supervisory team	SS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
30	Clerk of Works	12	17280h	0h	10/11/95 8:00am	6/18/96 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
30	Clerk of Works	12	$1,080,000.00	$0.00	$0.00	$1,080,000.00

15 Provide supervisory team $0.00 $1,323,000.00 $0.00

ID	Predecessor Name	Type	Lag
14	Provide resident clerk of works	SS	0d

ID	Successor Name	Type	Lag
16	Commission and handover site	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
2	Project Co-ordinator	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
3	Co-ordinator Architecture	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
6	Co-ordinator Quantity Surveying	1	288h	0h	10/11/95 8:00am	11/29/95 5:00pm
9	Architect 3	2	2880h	0h	10/11/95 8:00am	6/18/96 5:00pm
12	Civil/Structural Engr. 3	2	2880h	0h	10/11/95 8:00am	6/18/96 5:00pm
16	Elect./Mech. Engr. 3	2	2880h	0h	10/11/95 8:00am	6/18/96 5:00pm
19	Quantity Surveyor 3	2	2880h	0h	10/11/95 8:00am	6/18/96 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$54,000.00	$0.00	$0.00	$54,000.00
2	Project Co-ordinator	1	$45,000.00	$0.00	$0.00	$45,000.00
3	Co-ordinator Architecture	1	$36,000.00	$0.00	$0.00	$36,000.00
4	Co-ordinator Civil/Structural Eng.	1	$36,000.00	$0.00	$0.00	$36,000.00
5	Co-ordinator Elect/Mech Eng.	1	$36,000.00	$0.00	$0.00	$36,000.00
6	Co-ordinator Quantity Surveying	1	$36,000.00	$0.00	$0.00	$36,000.00
9	Architect 3	2	$270,000.00	$0.00	$0.00	$270,000.00
12	Civil/Structural Engr. 3	2	$270,000.00	$0.00	$0.00	$270,000.00
16	Elect./Mech. Engr. 3	2	$270,000.00	$0.00	$0.00	$270,000.00
19	Quantity Surveyor 3	2	$270,000.00	$0.00	$0.00	$270,000.00

16 Commission and handover site $0.00 $405,000.00 $0.00

ID	Predecessor Name	Type	Lag
15	Provide supervisory team	FS	0d

ID	Successor Name	Type	Lag
17	Provide as-built drawings	FS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
2	Project Co-ordinator	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
3	Co-ordinator Architecture	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm
6	Co-ordinator Quantity Surveying	1	480h	0h	6/19/96 8:00am	9/10/96 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$90,000.00	$0.00	$0.00	$90,000.00
2	Project Co-ordinator	1	$75,000.00	$0.00	$0.00	$75,000.00
3	Co-ordinator Architecture	1	$60,000.00	$0.00	$0.00	$60,000.00
4	Co-ordinator Civil/Structural Eng.	1	$60,000.00	$0.00	$0.00	$60,000.00
5	Co-ordinator Elect/Mech Eng.	1	$60,000.00	$0.00	$0.00	$60,000.00
6	Co-ordinator Quantity Surveying	1	$60,000.00	$0.00	$0.00	$60,000.00

ID	Name	Fixed Cost	Total Cost	Planned
17	Provide as-built drawings	$0.00	$900,000.00	$0.00

ID	Predecessor Name	Type	Lag
16	Commission and handover site	FS	0d

ID	Successor Name	Type	Lag
18	Provide maintenance manual	SS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
2	Project Co-ordinator	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
3	Co-ordinator Architecture	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
6	Co-ordinator Quantity Surveying	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
9	Architect 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
12	Civil/Structural Engr. 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
16	Elect./Mech. Engr. 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
19	Quantity Surveyor 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
31	Architectural Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
32	Civil/Structural Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
33	Elect./Mech. Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm

ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$120,000.00	$0.00	$0.00	$120,000.00
2	Project Co-ordinator	1	$100,000.00	$0.00	$0.00	$100,000.00
3	Co-ordinator Architecture	1	$80,000.00	$0.00	$0.00	$80,000.00
4	Co-ordinator Civil/Structural Eng.	1	$80,000.00	$0.00	$0.00	$80,000.00
5	Co-ordinator Elect/Mech Eng.	1	$80,000.00	$0.00	$0.00	$80,000.00
6	Co-ordinator Quantity Surveying	1	$80,000.00	$0.00	$0.00	$80,000.00
9	Architect 3	2	$60,000.00	$0.00	$0.00	$60,000.00
12	Civil/Structural Engr. 3	2	$60,000.00	$0.00	$0.00	$60,000.00
16	Elect./Mech. Engr. 3	2	$60,000.00	$0.00	$0.00	$60,000.00
19	Quantity Surveyor 3	2	$60,000.00	$0.00	$0.00	$60,000.00
31	Architectural Technician 3	2	$40,000.00	$0.00	$0.00	$40,000.00
32	Civil/Structural Technician 3	2	$40,000.00	$0.00	$0.00	$40,000.00
33	Elect./Mech. Technician 3	2	$40,000.00	$0.00	$0.00	$40,000.00

ID	Name	Fixed Cost	Total Cost	Planned
18	Provide maintenance manual	$0.00	$900,000.00	$0.00

ID	Predecessor Name	Type	Lag
17	Provide as-built drawings	SS	0d

ID	Resource Name	Units	Work	Delay	Scheduled Start	Scheduled Finish
1	Partner In Charge	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
2	Project Co-ordinator	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
3	Co-ordinator Architecture	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
4	Co-ordinator Civil/Structural Eng.	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
5	Co-ordinator Elect/Mech Eng.	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
6	Co-ordinator Quantity Surveying	1	640h	0h	9/11/96 8:00am	12/31/96 5:00pm
9	Architect 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
12	Civil/Structural Engr. 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
16	Elect./Mech. Engr. 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
19	Quantity Surveyor 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
31	Architectural Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
32	Civil/Structural Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm
33	Elect./Mech. Technician 3	2	640h	0h	9/11/96 8:00am	11/5/96 5:00pm

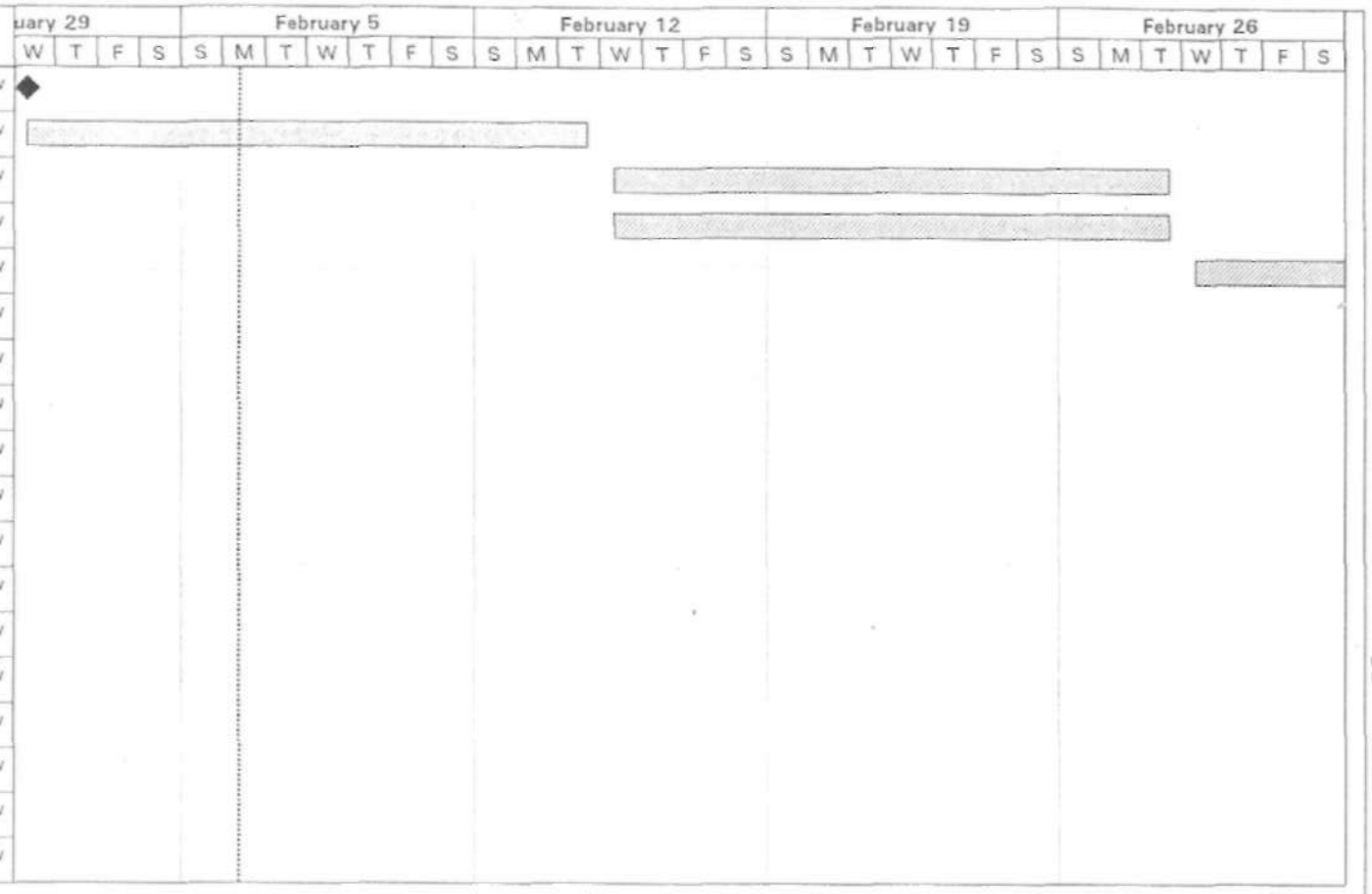
ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
1	Partner In Charge	1	$120,000.00	$0.00	$0.00	$120,000.00
2	Project Co-ordinator	1	$100,000.00	$0.00	$0.00	$100,000.00
3	Co-ordinator Architecture	1	$80,000.00	$0.00	$0.00	$80,000.00
4	Co-ordinator Civil/Structural Eng.	1	$80,000.00	$0.00	$0.00	$80,000.00
5	Co-ordinator Elect/Mech Eng.	1	$80,000.00	$0.00	$0.00	$80,000.00
6	Co-ordinator Quantity Surveying	1	$80,000.00	$0.00	$0.00	$80,000.00
9	Architect 3	2	$60,000.00	$0.00	$0.00	$60,000.00
12	Civil/Structural Engr. 3	2	$60,000.00	$0.00	$0.00	$60,000.00
16	Elect./Mech. Engr. 3	2	$60,000.00	$0.00	$0.00	$60,000.00
19	Quantity Surveyor 3	2	$60,000.00	$0.00	$0.00	$60,000.00
31	Architectural Technician 3	2	$40,000.00	$0.00	$0.00	$40,000.00

ID	Name	Fixed Cost	Total Cost	Planned

"Provide maintenance manual" continued

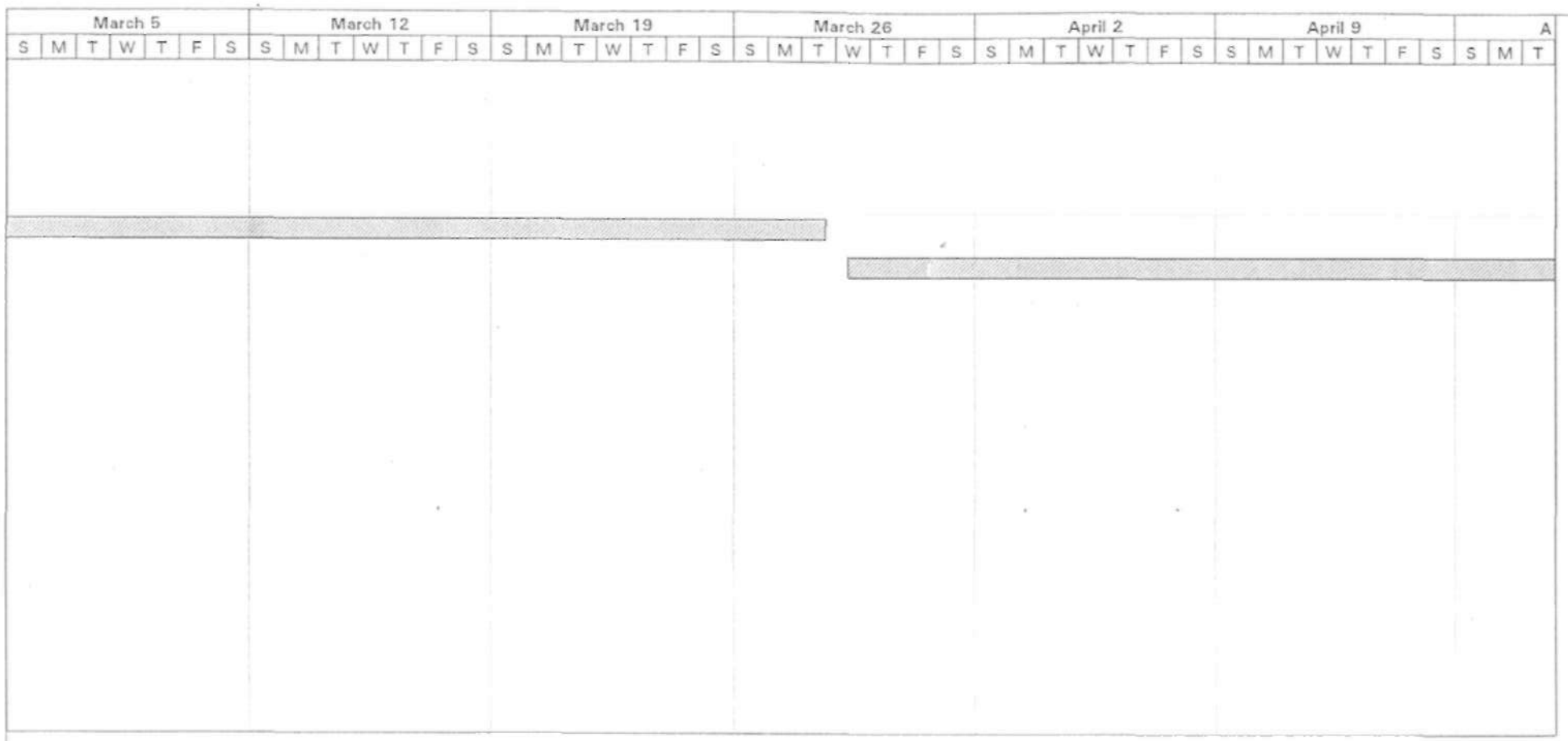
ID	Resource Name	Units	Cost	Plan Cost	Act. Cost	Rem. Cost
32	Civil/Structural Technician 3	2	$40,000.00	$0.00	$0.00	$40,000.00
33	Elect./Mech. Technician 3	2	$40,000.00	$0.00	$0.00	$40,000.00
			$0.00	$7,073,000.00		$0.00

ID	Name	Duration
1	Start Project	0w
2	Visit each hospital	2w
3	Detail out needs in hospitals	2w
4	Survey each hospital	2w
5	Prepare preliminary drawings	4w
6	Produce working drawings	8w
7	Produce tender documents	8w
8	Obtain PIU approvals	2w
9	Obtain ADF approvals and iss	8w
10	Carry out tender evaluation	1w
11	Approval for tender evaluation	1w
12	Issue approved tender docs	2w
13	Handover site to contractor	2w
14	Provide resident clerk of wor	36w
15	Provide supervisory team	36w
16	Commission and handover sit	12w
17	Provide as-built drawings	16w
18	Provide maintenance manual	16w



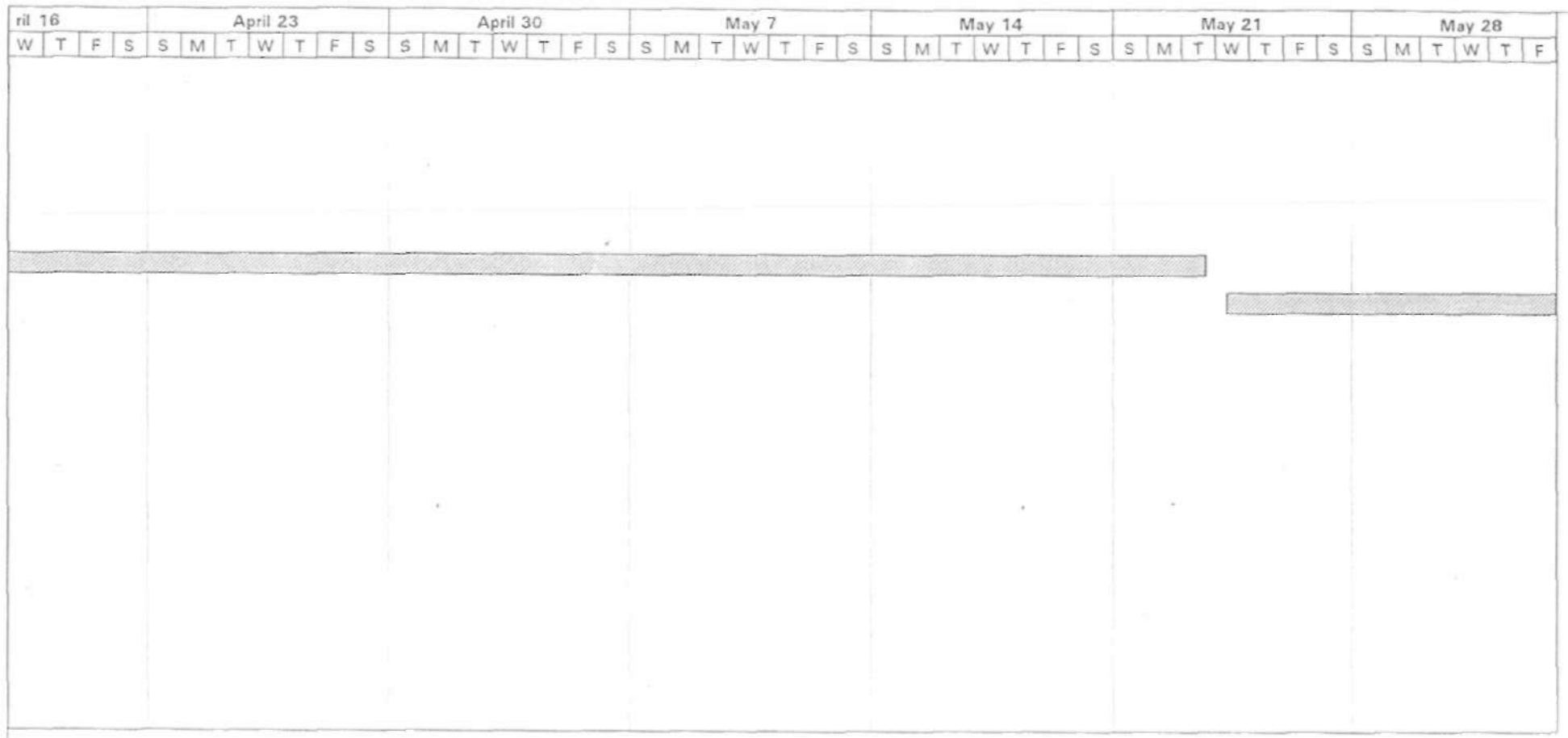
Project: Sokoto Health Services R
Date: 2/6/95

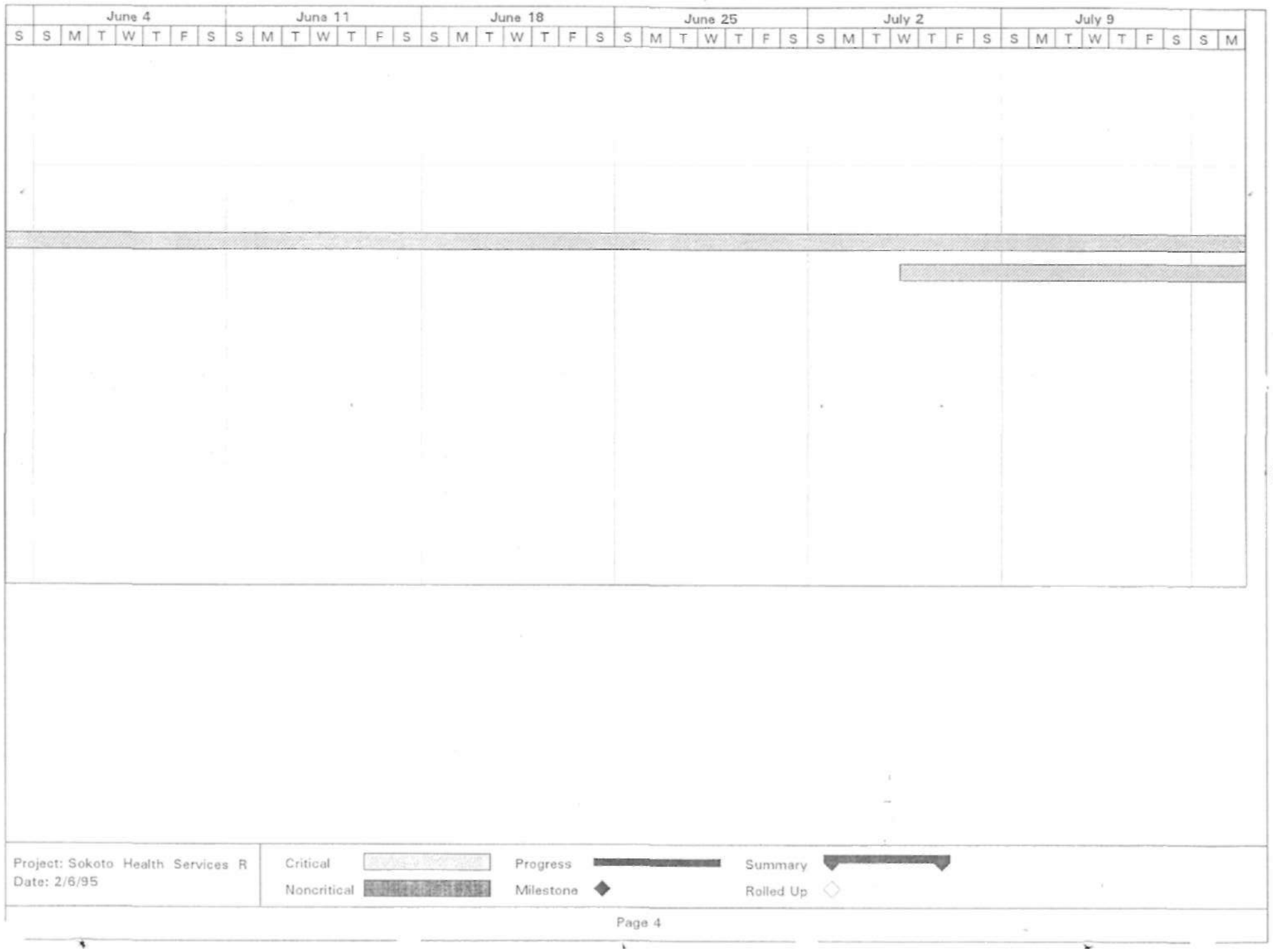
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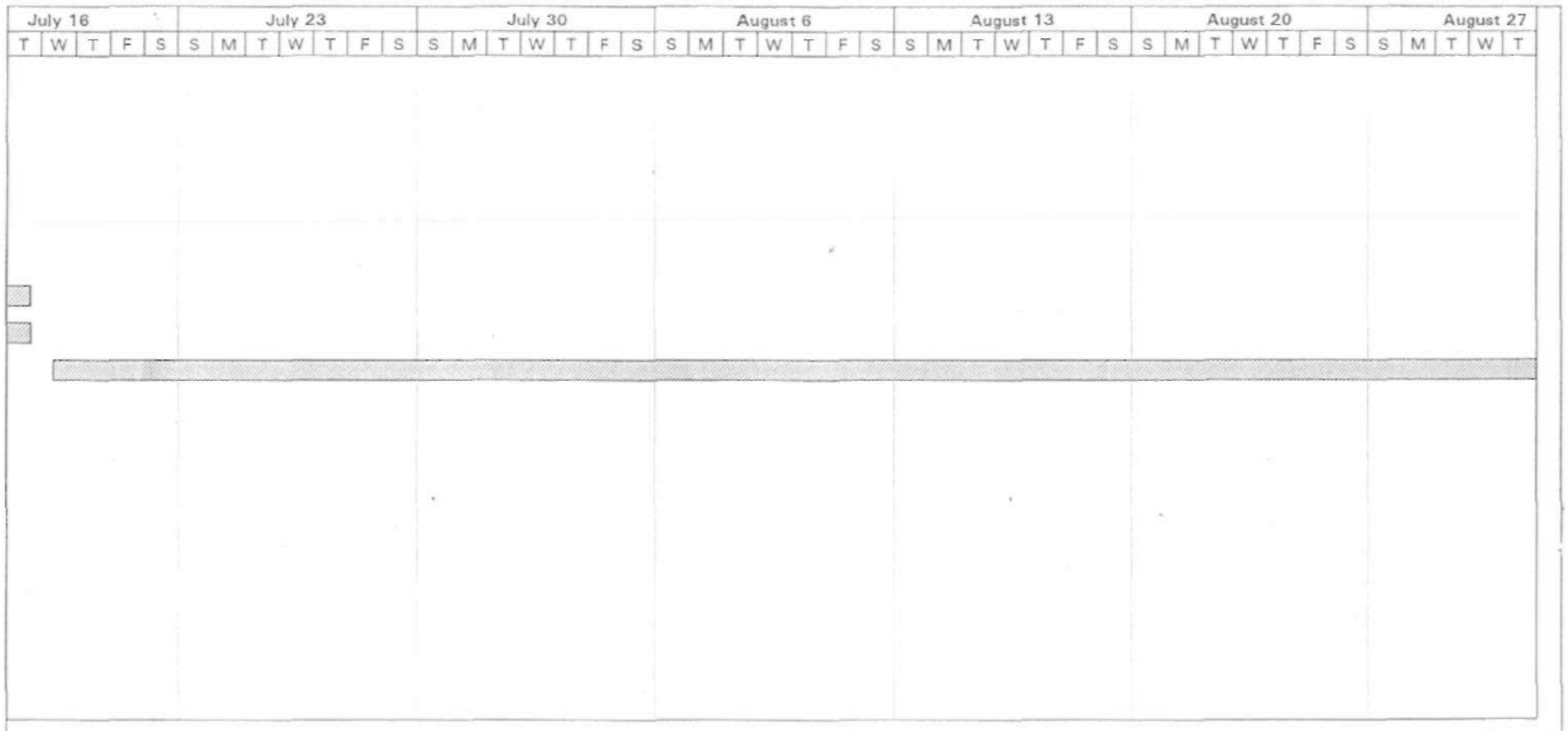


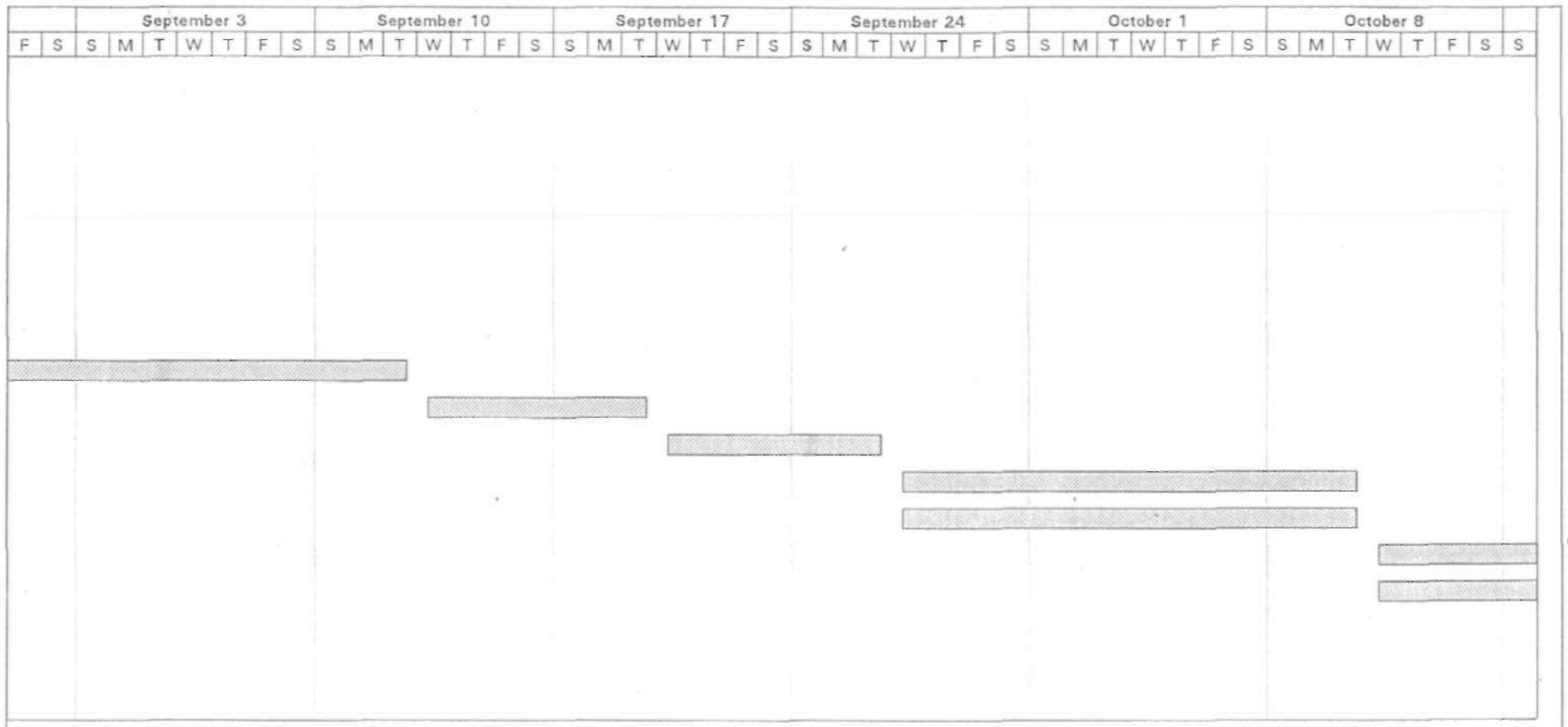
Project: Sokoto Health Services R
Date: 2/6/95

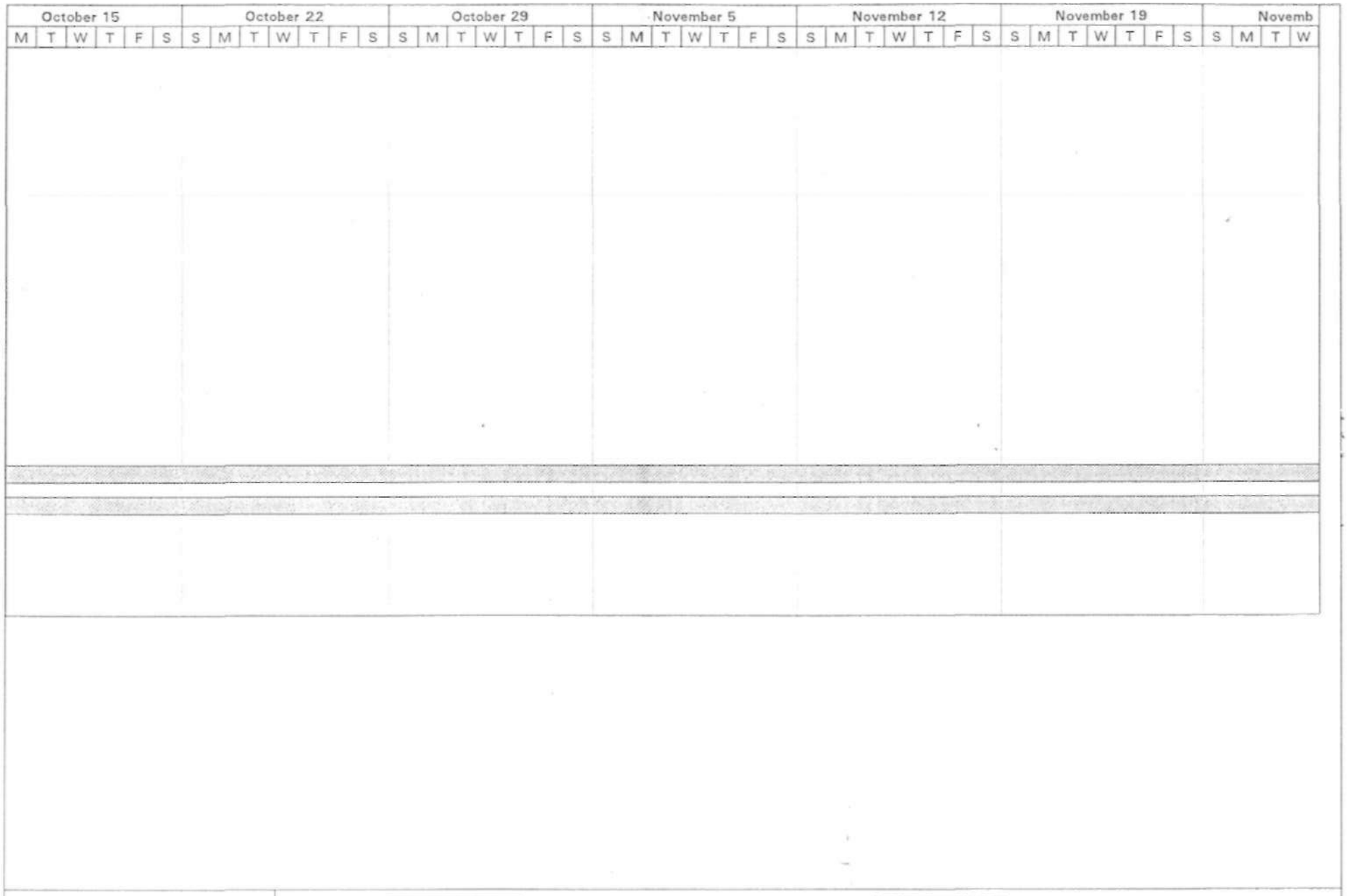
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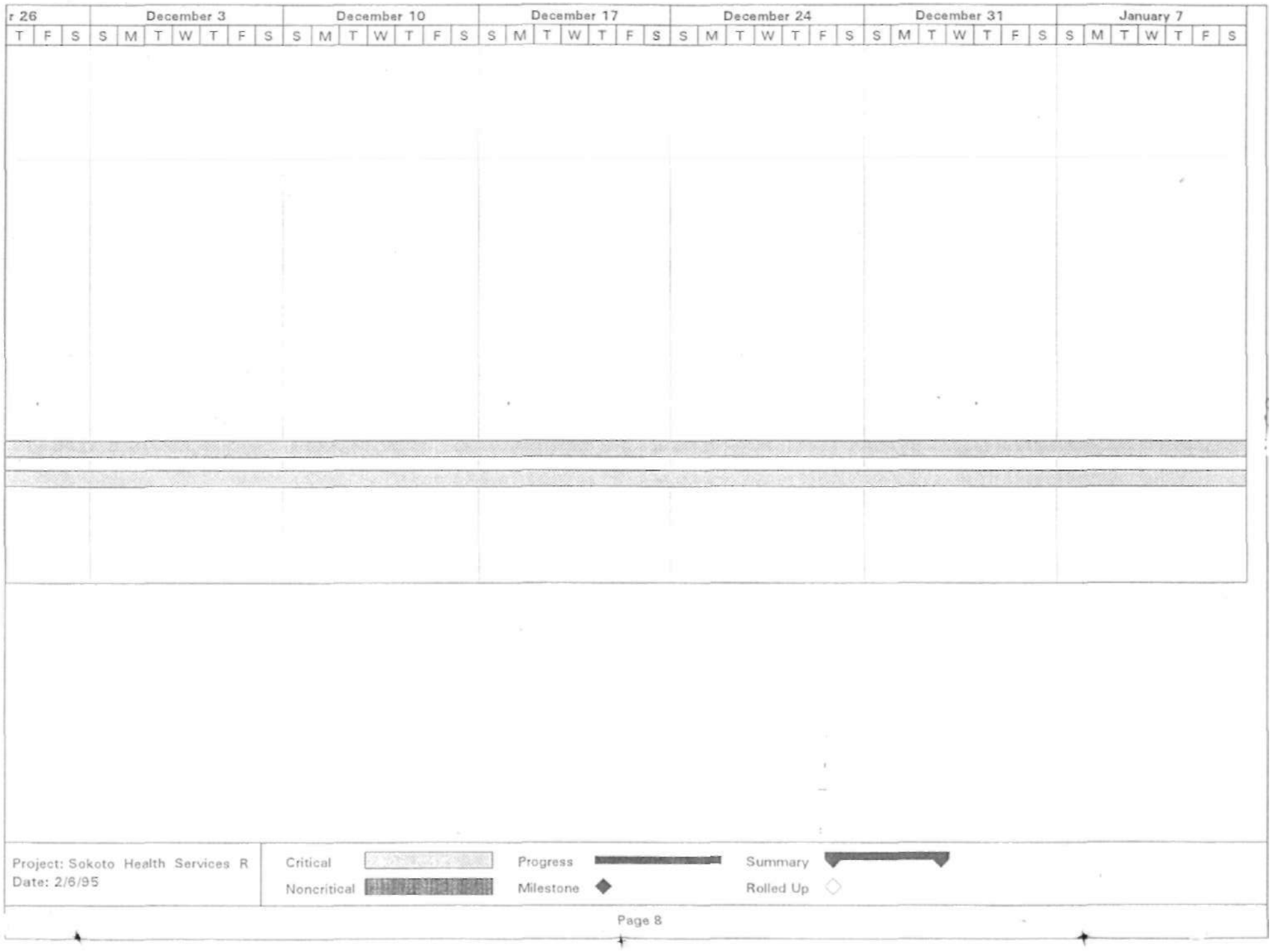

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Project: Sokoto Health Services R
Date: 2/6/95
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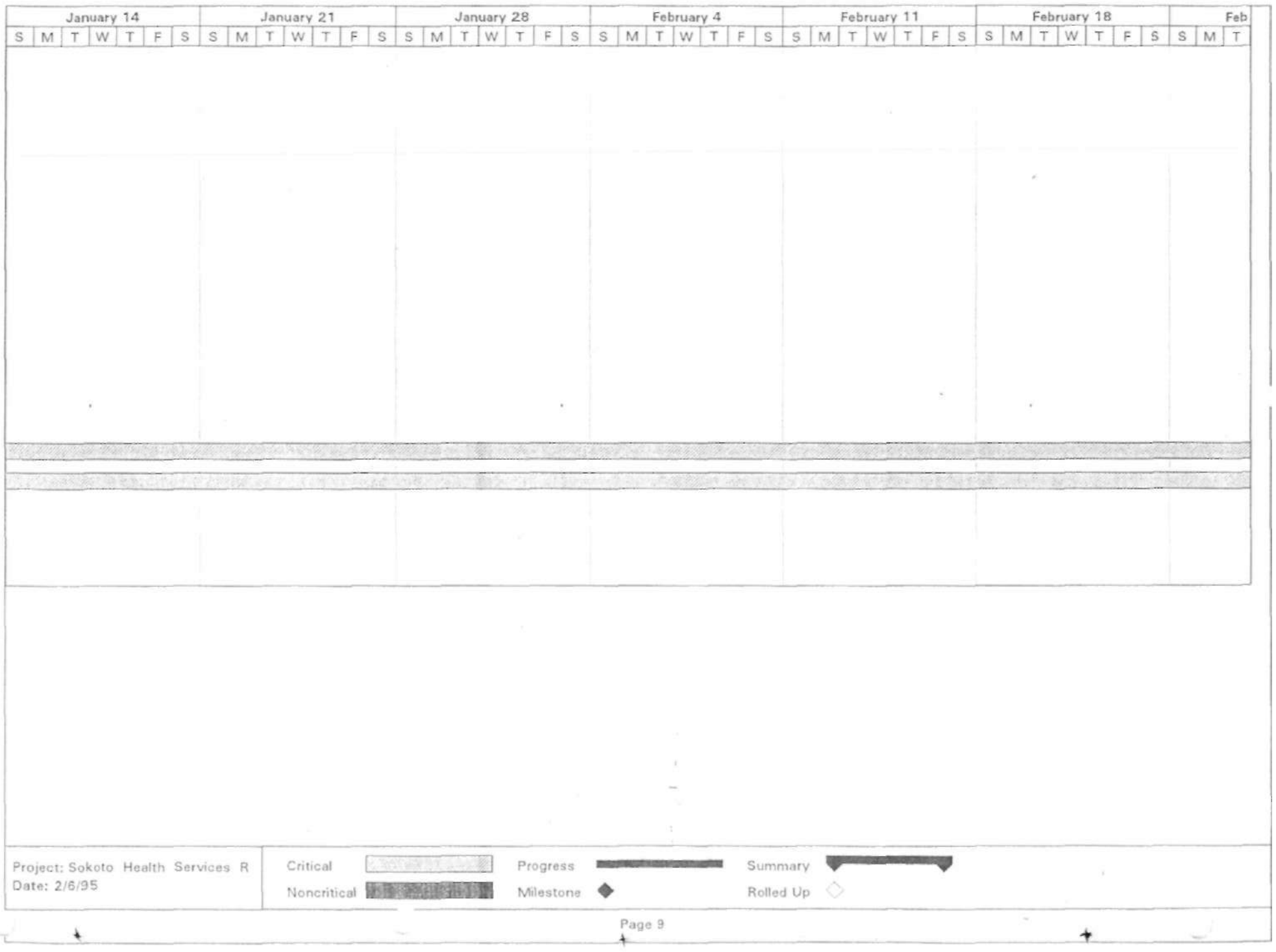

June 4
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Date: 2/6/95
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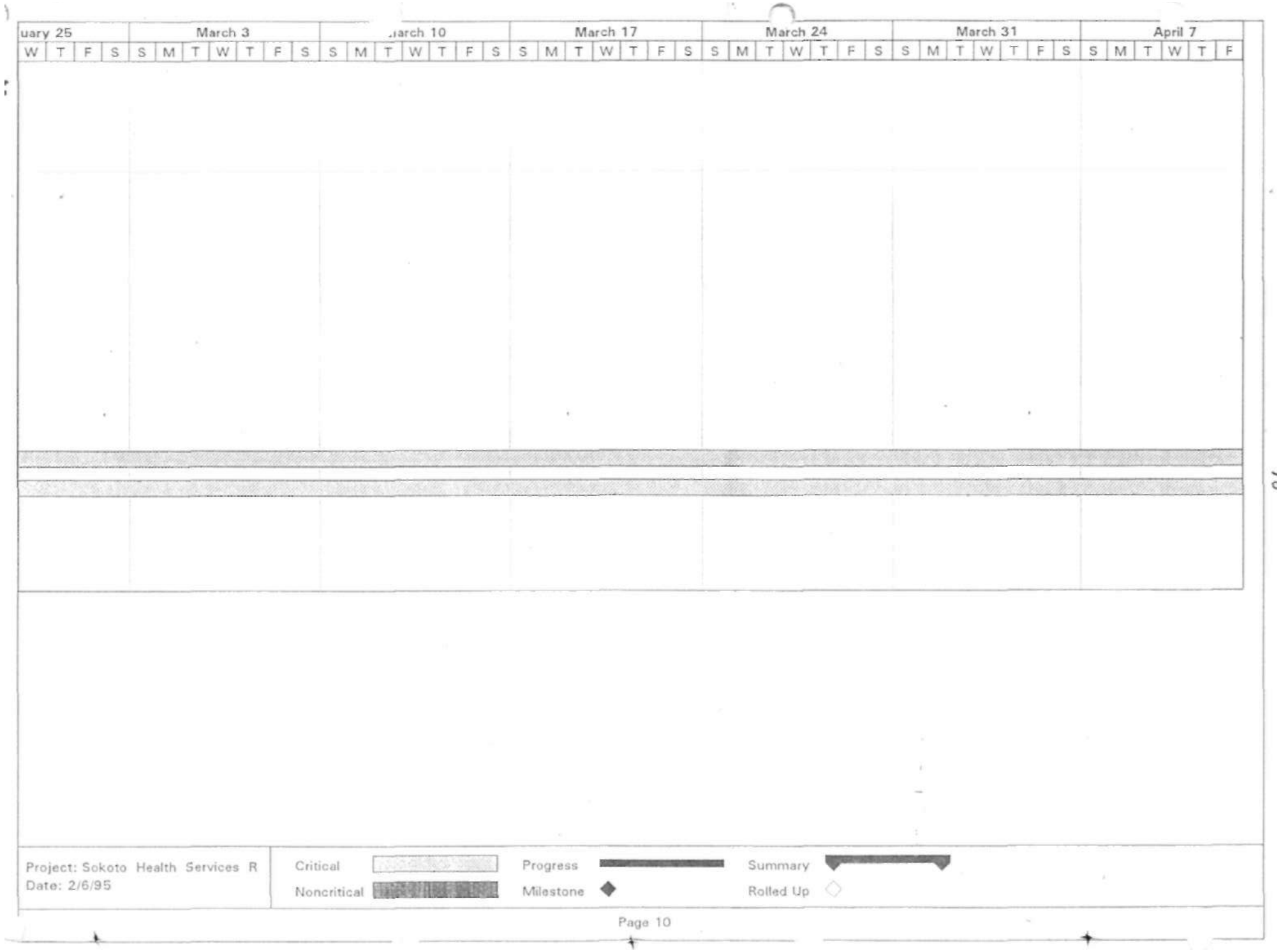

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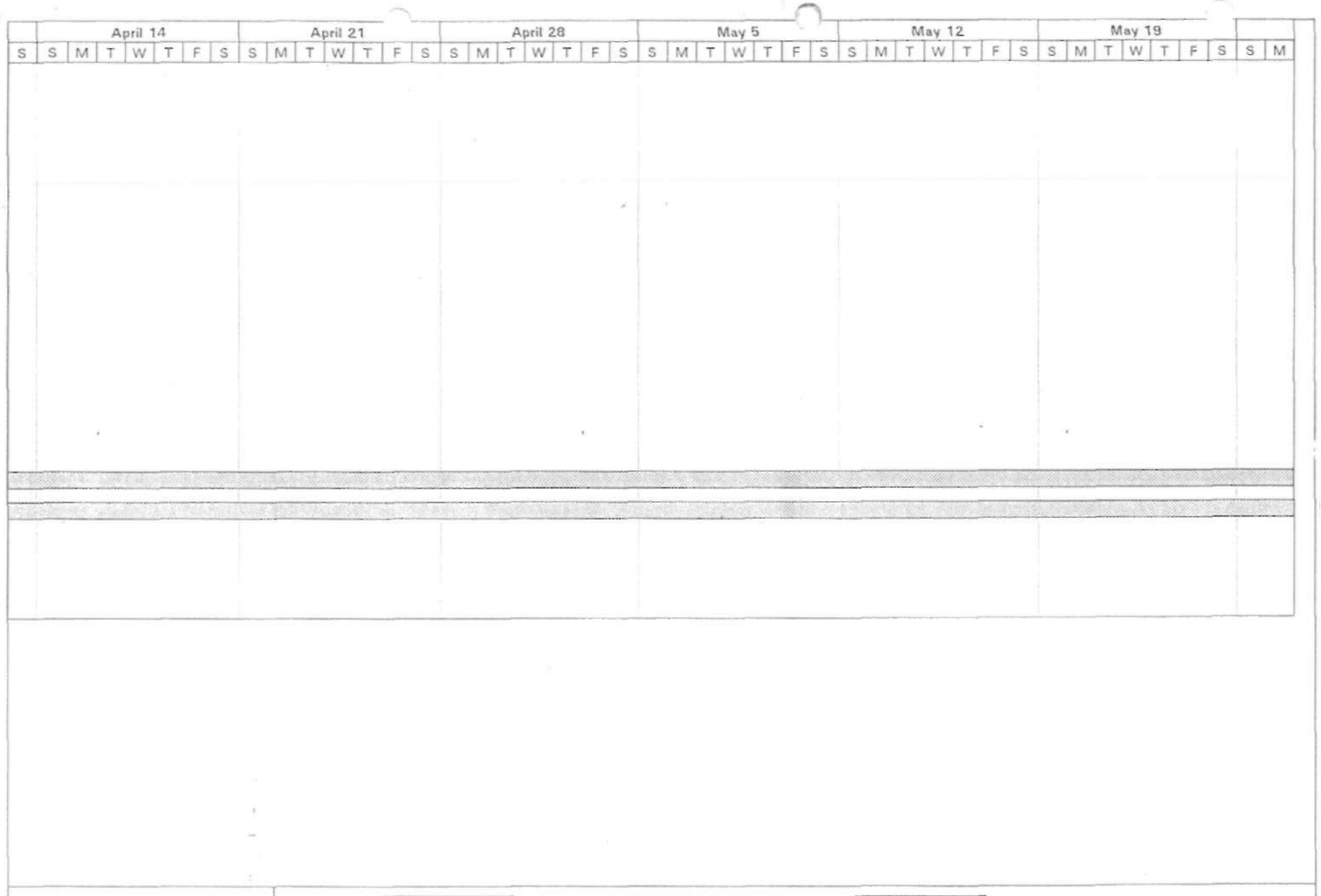

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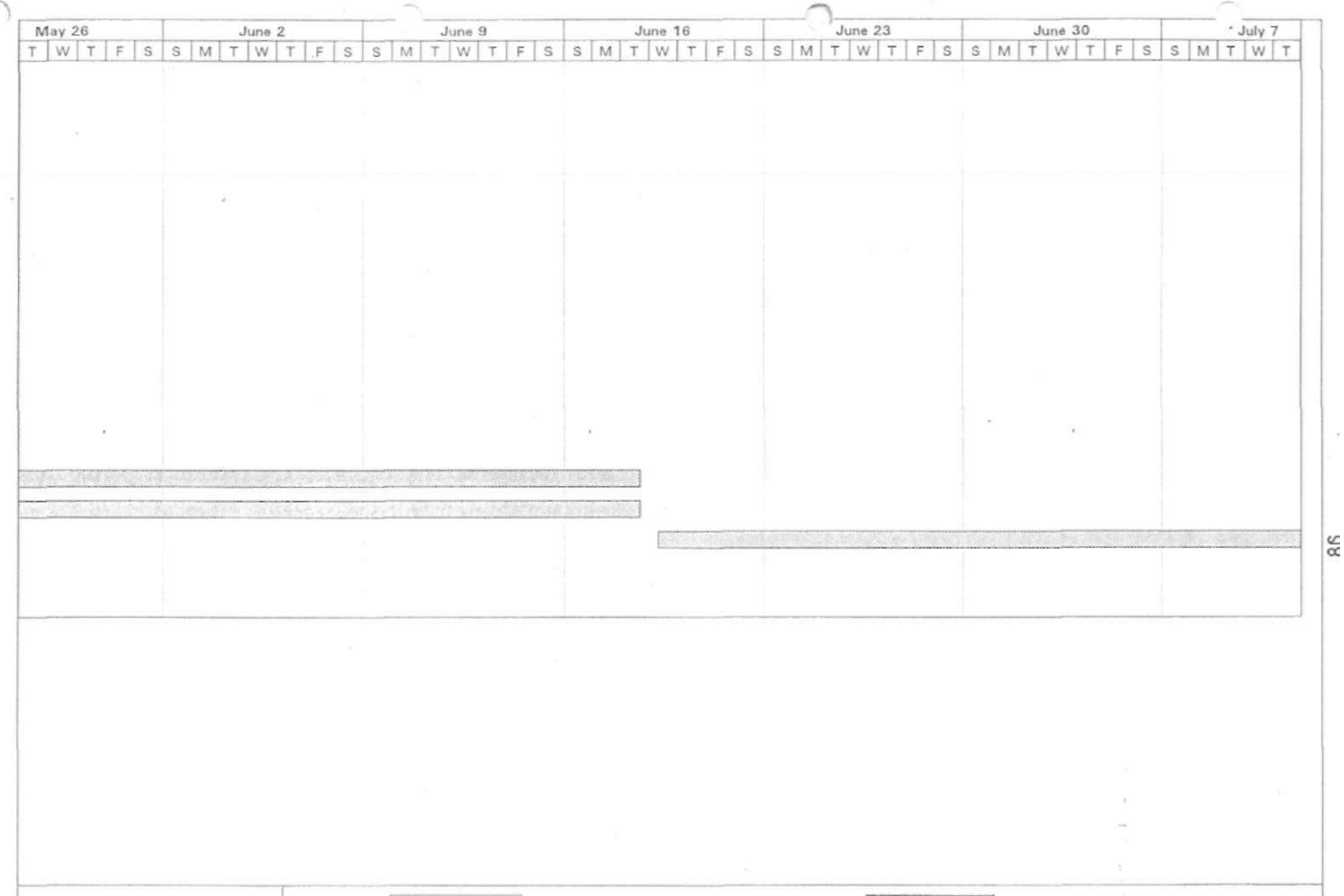

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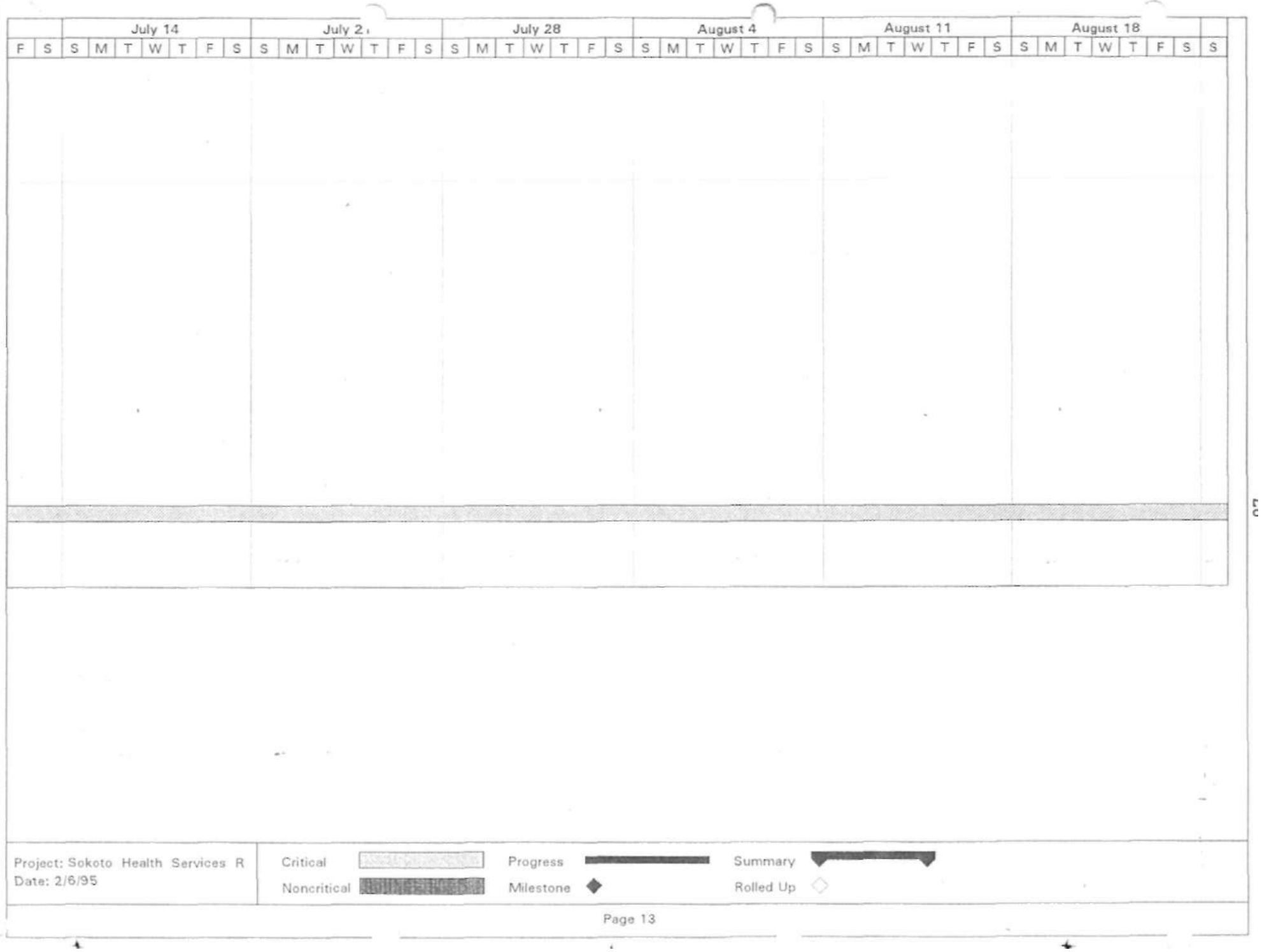

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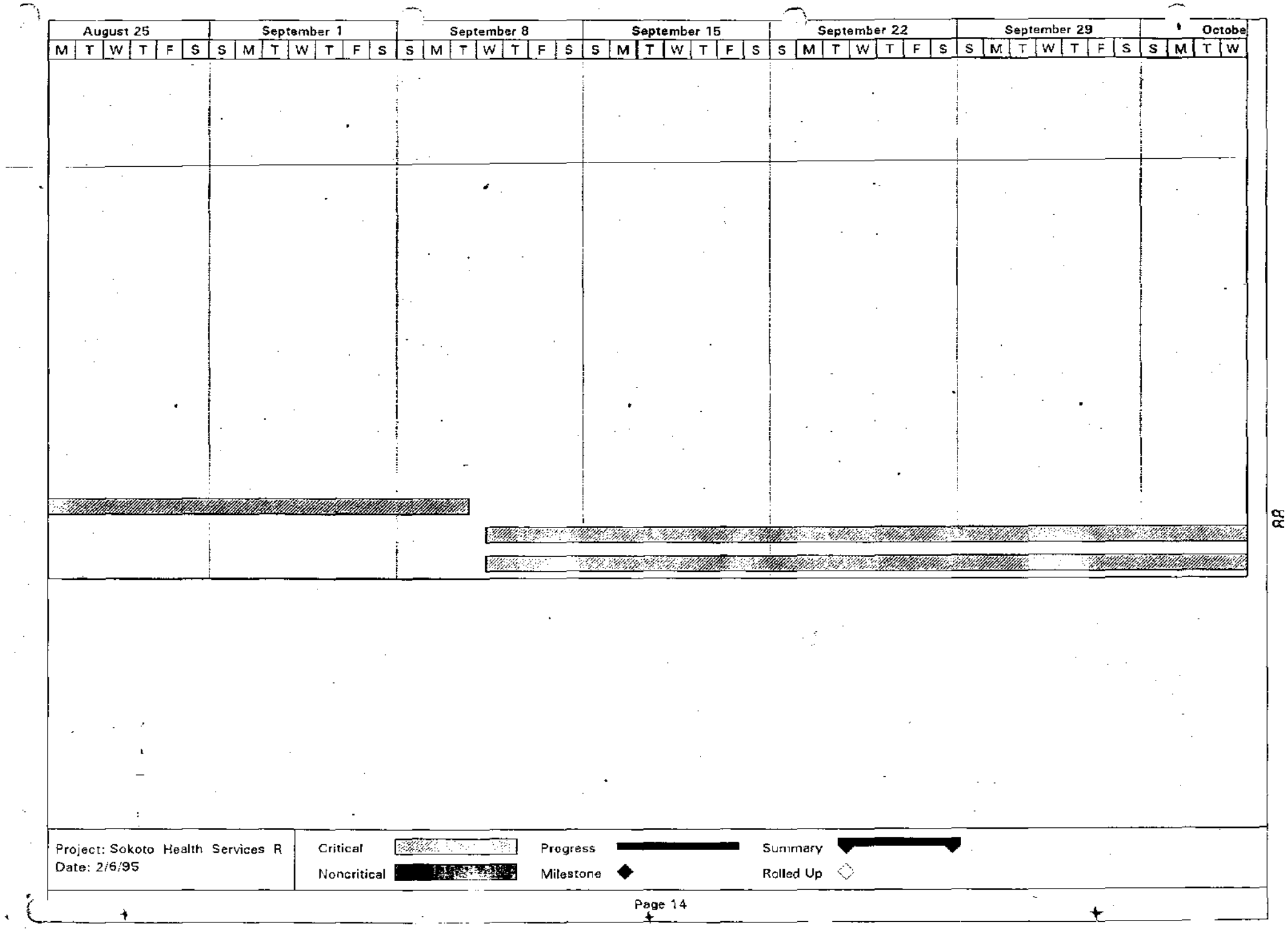

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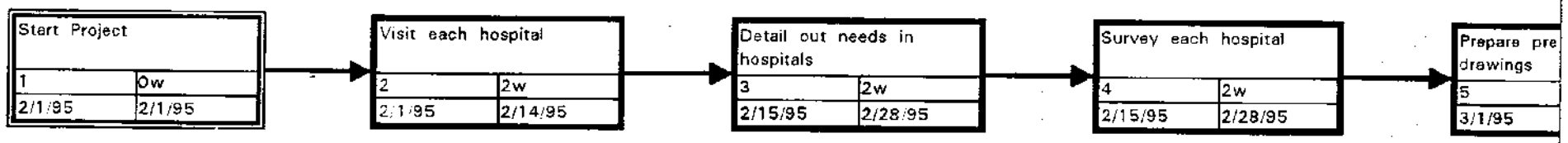

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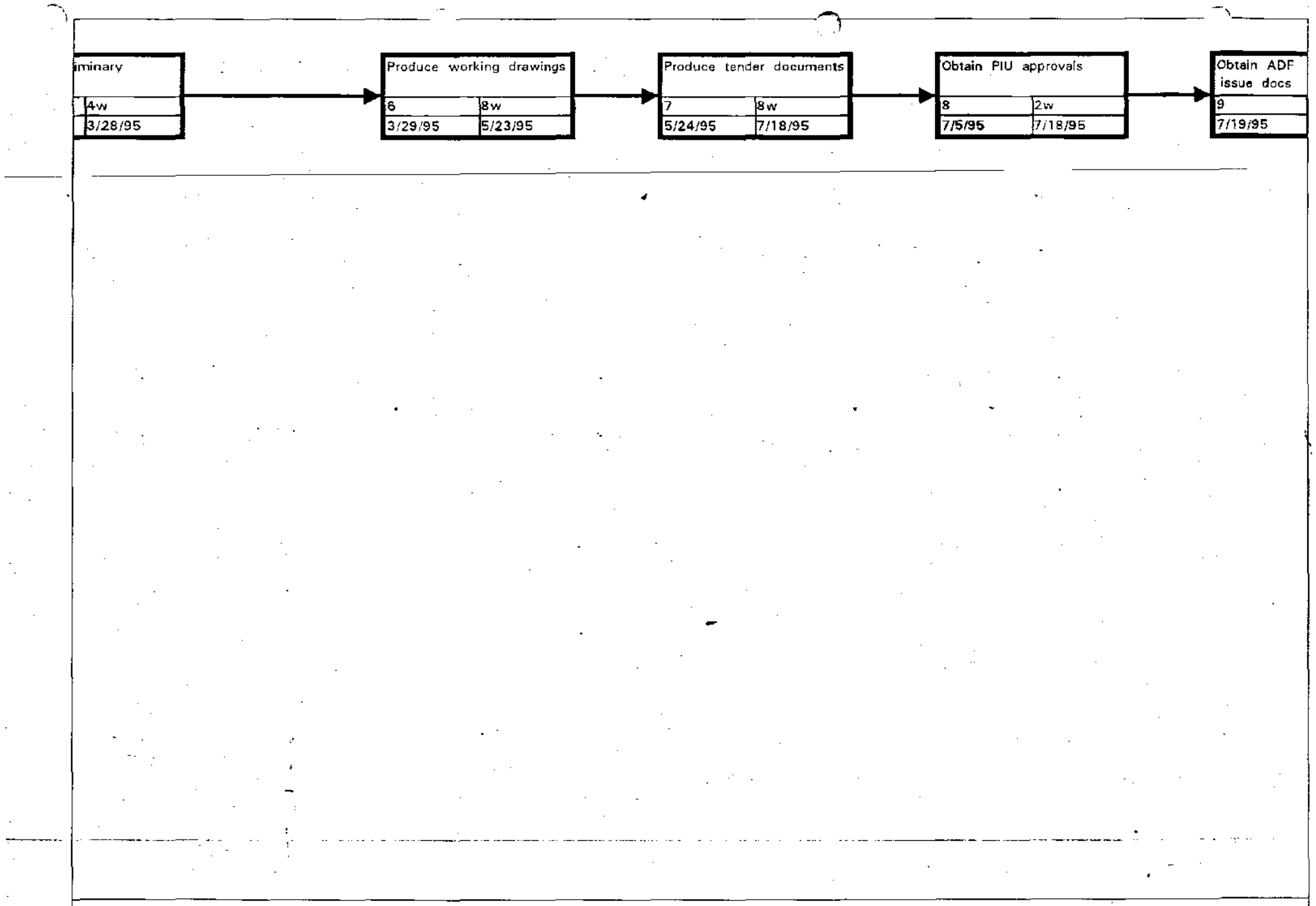

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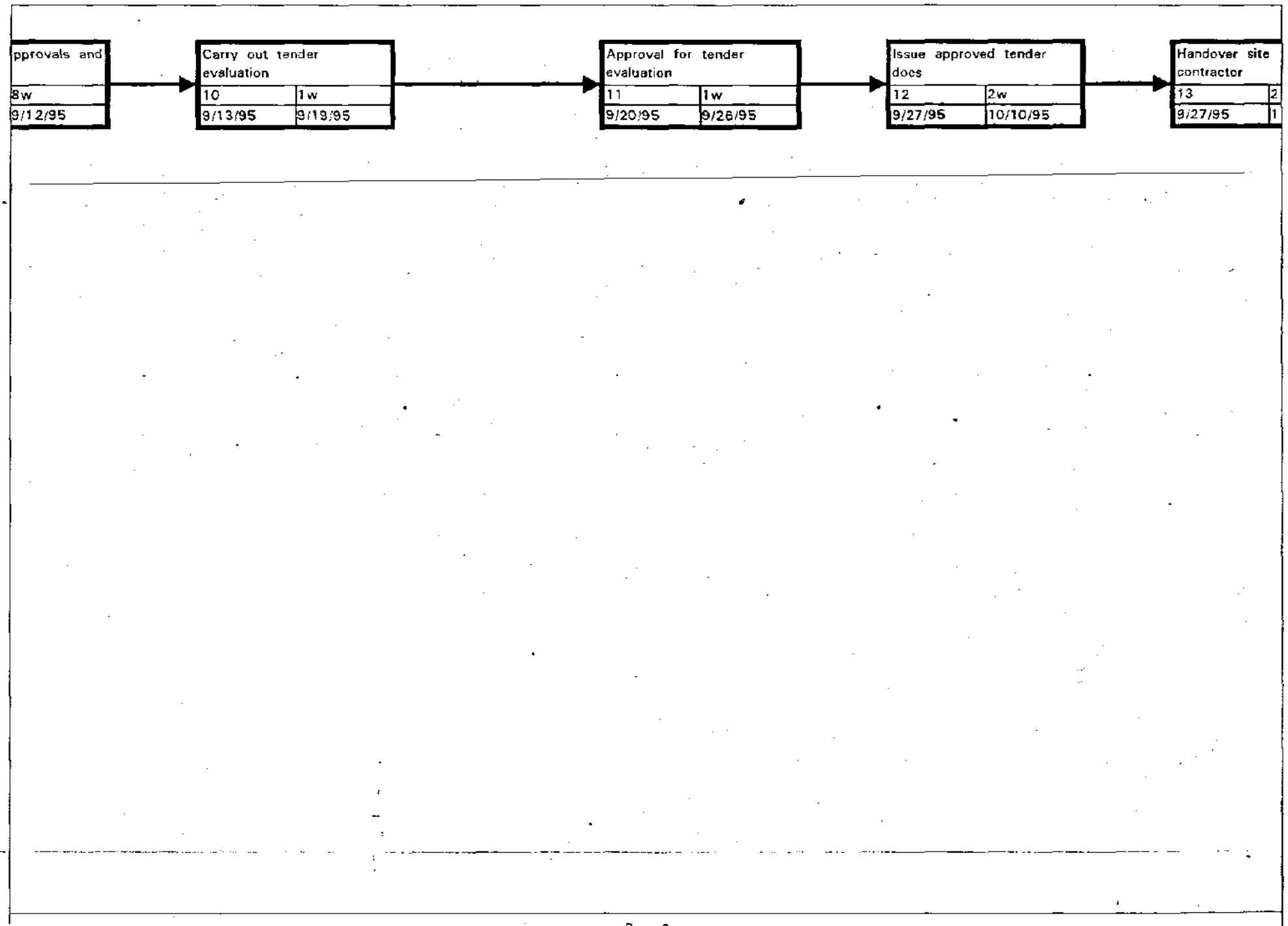

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June 16
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July 7
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Date: 2/6/95
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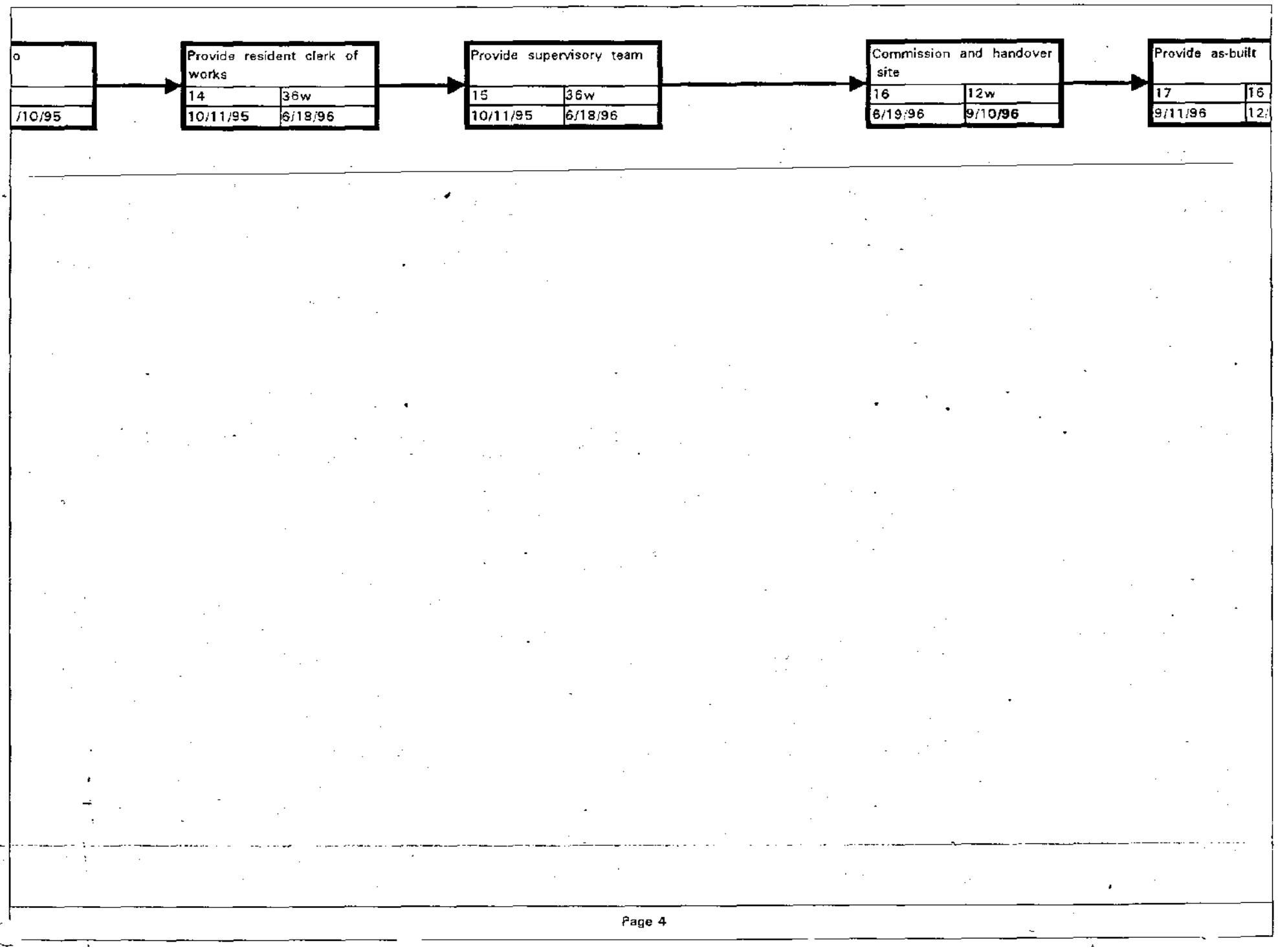

July 14
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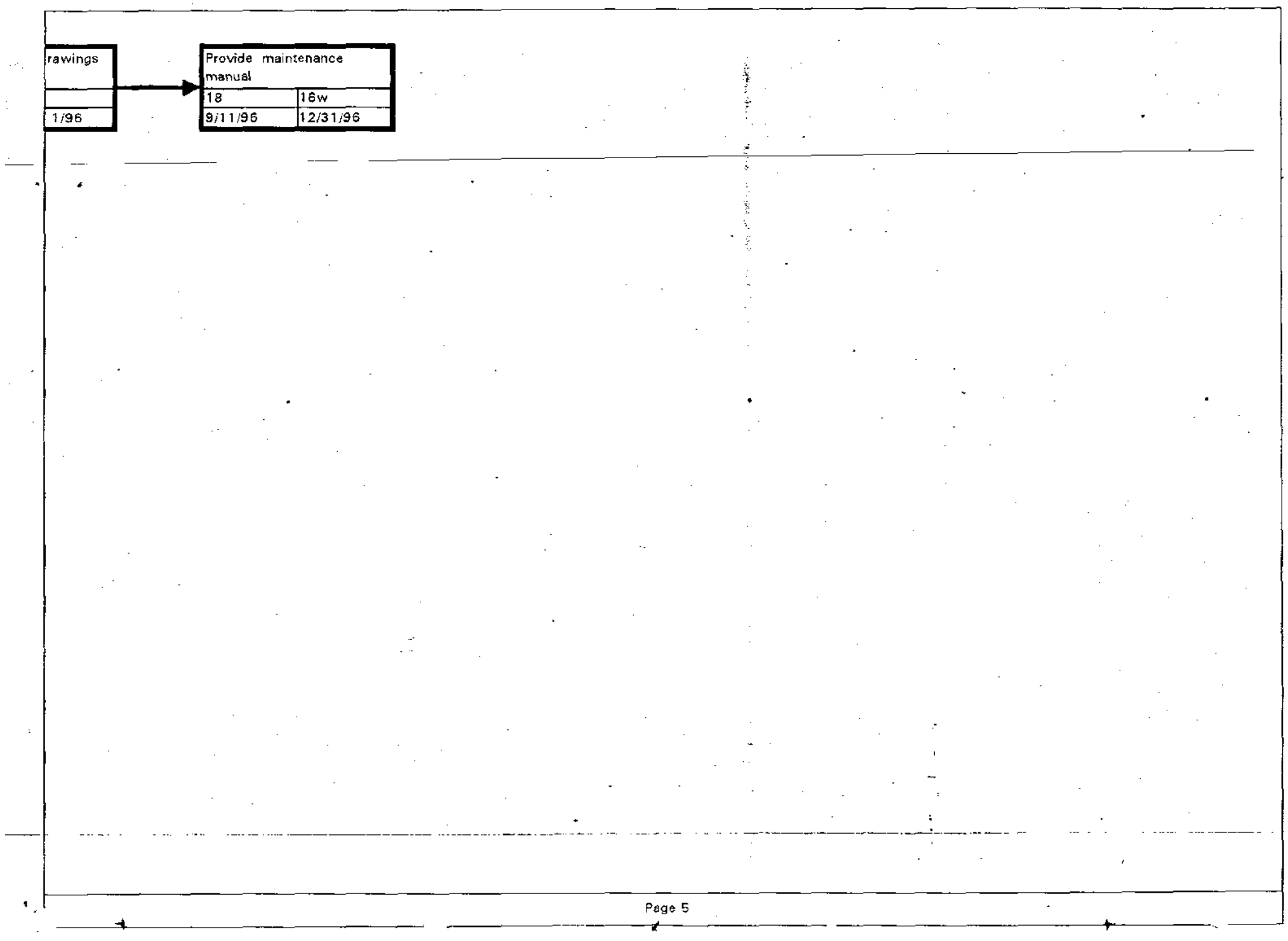

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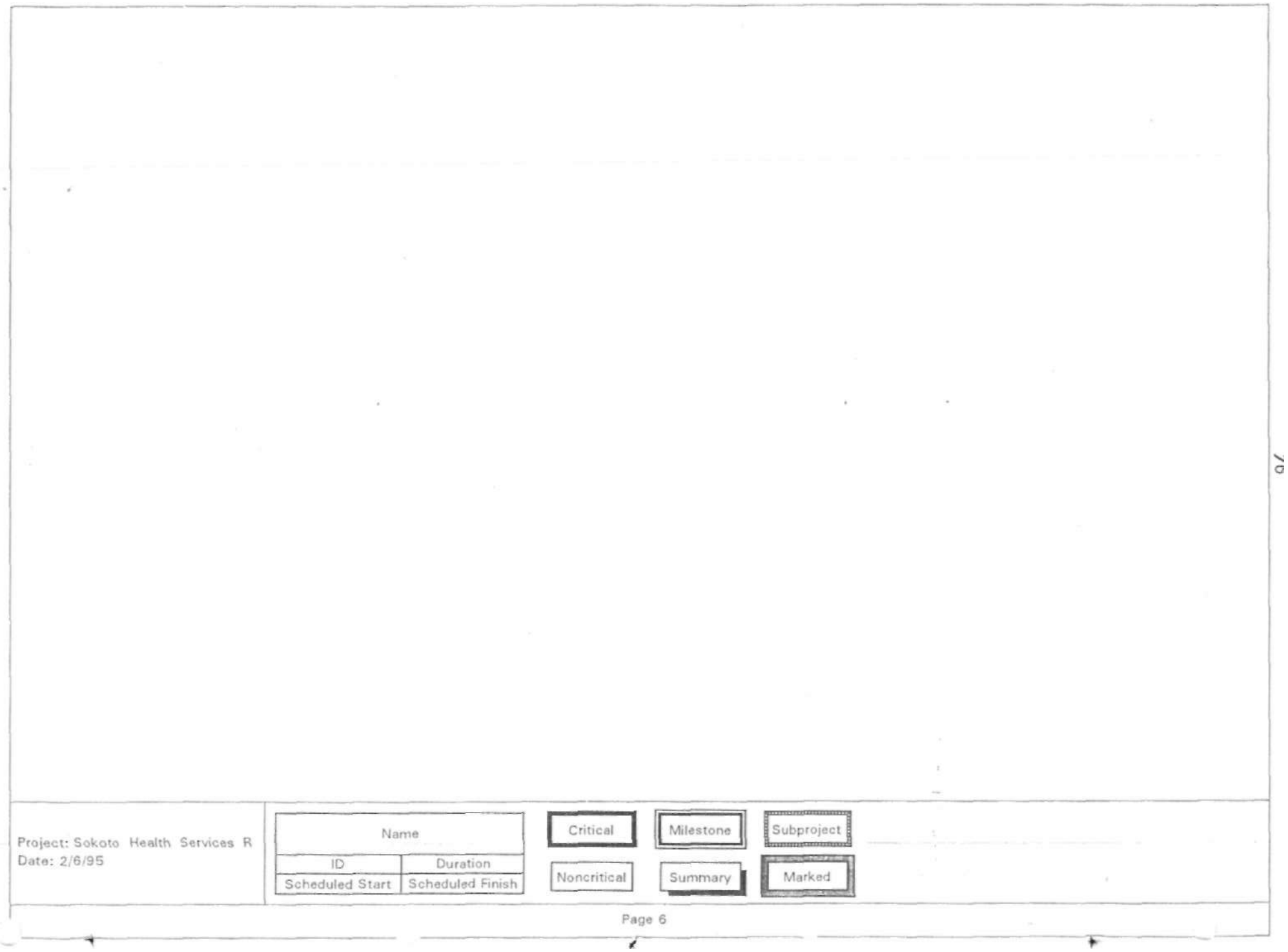

Start Project
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2/1/95
Visit each hospital
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2/1/95
2/14/95
Detail out needs in hospitals
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2/28/95
Survey each hospital
4
2w
2/15/95
2/28/95
Prepare pre drawings
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iminary
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3/28/95
Produce working drawings
6
8w
3/29/95
5/23/95
Produce tender documents
7
8w
5/24/95
7/18/95
Obtain PIU approvals
8
2w
7/5/95
7/18/95
Obtain ADF issue docs
9
7/19/95


pprovals and
8w
9/12/95
Carry out tender evaluation
10
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9/19/95
Approval for tender evaluation
11
1w
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9/26/95
Issue approved tender docs
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2w
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Handover site contractor
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Provide resident clerk of works
14
36w
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6/18/96
Provide supervisory team
15
36w
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6/18/96
Commission and handover site
16
12w
6/19/96
9/10/96
Provide as-built
17
16
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rawings
1/96
Provide maintenance manual
18
16w
9/11/96
12/31/96



Project: Sokoto Health Services R
Date: 2/6/95

Name	
ID	Duration
Scheduled Start	Scheduled Finish

Critical | Milestone | Subproject
Noncritical | Summary | Marked

Predecessors	Resource Names
1	Partner In Charge,Projec
2	Partner In Charge,Projec
3SS	Land Surveyor[5],Land
4	Partner In Charge,Co-or
5	Partner In Charge,Projec
6	Partner In Charge,Projec
7FF	Project Co-ordinator,Co-o
8	Partner In Charge,Projec
9	Partner In Charge,Projec
10	Partner In Charge,Projec
11	Project Co-ordinator,Co-o
12SS	Partner In Charge,Projec
13	Clerk of Works[12]
14SS	Partner In Charge,Projec
15	Partner In Charge,Projec
16	Partner In Charge,Projec
17SS	Partner In Charge,Projec

CHAPTER 5

EVALUATION OF RESULTS

The result of computer method indicates a more rational approach to project management. From the results obtained, the personnel cost of executing the project using computer methods came to ₦7,073,000.00 while the same cost using the manual method was ₦11,950,000.00. This is about 40% savings. Thus in a competitive bidding exercise, the computer method gives a more cost efficient approach.

The computer method is able to detail out the cost associated with each task and the resource persons needed on each specific task. Thus expenditure can be controlled on a task by task basis. This implies that cost over runs can easily be detected early in the project life.

Furthermore the computer method details out the total remuneration associated with each resource person and consequently each group of professionals. Thus the cost to the project of the various professionals making up the multi-disciplinary team is easily known by all the participating members. This reduces rift and misunderstanding.

The results of the workplan could be displayed graphically in a Gantt Chart and PERT Chart form, using a computer approach. The graphical options available to the manual approach is limited and therefore presentation is a major draw back of the manual method.

Results obtained from the computer method have been limited to the seven schedules earlier indicated because of cost of production of the thesis. The computer method is capable of diverse results, modelling different scenarios to suit the specific need of the project manager. A lot of what if analysis could be done using the computers cost effective means of delivering the project. The use of pie charts, histograms and many other graphical display methods are easily generated from the computer results. The limitation to the power of the computer is any limitation in the expertise of the project manager in handling the software.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

In the light of the investigations carried out and the results obtained from both the manual and computer approaches to Project Management the following conclusion and recommendations are made.

7.1 CONCLUSIONS

In this project, a microsoft project software has been used to carry out the planning of an engineering project. The result of the computer application has been compared to a manual approach to project planning of the same engineering project. The result of the comparison confirms the works done so far by others and indicates the superiority of the computer approach to the manual method of engineering project management. The conclusions evident in this particular project include:

(1) That computer application to project management produces a more cost effective plan than the manual method.

(2) That cost efficiency makes computer approach a better means for procuring project in competitive biddings that are cost dependent.

(3) That the capacity to assign cost to each task in the work breakdown structure and also assign cost to each of the resources make for an efficient control system that ensures that cost over-runs are put in check.

(4) The ability to model different scenarios using the "what if" capability of the project management software gives the project manager a larger latitude to simulate different conditions and come out with the most efficient system of operation.

(5) The use of extensive graphics in the form of Gantt Charts, PERT Charts, Pie Charts and histograms, aid effective communication of project concepts and reduces misunderstanding amongst project operators.

(6) The ability to generate diverse schedules, including Task schedules, Resource schedules, Periodic resource reporting and periodic task report together with the flexibility of developing specific project calendars to suit specific tasks and resources are overwhelming advantages.

7.2 Recommendations

On the basis of this authors experience in carrying out thus project, the following recommendations are considered worthwhile.

(a) Engineering professionals and indeed all project managers should be encouraged to adopt a computer approach to project management. Thus abandonment usually associated with delays and cost over-runs.

(b) Project Management as a field of study should be introduced at postgraduate level in our institutions of higher learning. The course would only be available to professionals that have practiced for five or more years.

(c) Regular refresher courses on project management principles and in particular computer application to project management be organised by professional bodies to improve on availability of expertise and reduce wastage due to poor management.

(d) that federal and state agencies involved in running projects be compelled to hire only properly trained project managers who are willing to embrace the computer approach for the management of their projects.

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APPENDIX A

TERMS OF REFERENCE AS GIVEN

TERMS OF REFERENCE

1400 INTRODUCTION

1.10 Geographic and Economic Setting

1.11 Location

Sokoto State is one of the thirty States which along with the Federal Capital at Abuja make up the Federal Republic of Nigeria. It lies in the North West of Nigeria between Latitude 11°N and 14°N and longitude 4°E and 7°E. Sokoto State has a land area of approximately 60,000 square kilometres. It is bounded to the north by the Republic of Niger, south west by Sokoto State, south by Kaduna and Niger States and on the east by Katsina State. It consists of 29 Local Government Areas. Sokoto has long been the home of the Sultan who is the traditional leader of the muslims in the West African Sub-region. In the recently released 1991 provisional census figures, Sokoto State's population stood at a total of 4,329,391 with 2,150,111 males and 2,234,200 females.

1.12 Climate

Sokoto State falls within the Sahara belt of West Africa and its northern borders falls within the southern fringes of the Sahara desert. It's climate is dominated by the dry season lasting from early October to early June. Daily temperatures ranges from 15° - 35°C during much of this period. The dust laden Harmattan wind which is most prominent during November to February, brings along hazy and dry weather with relative humidity as low as 10% for much of the period. The weather gets hotter from March onwards, and the rain arrives suddenly in heavy thunder storms around June and ceases abruptly around September/October. The wettest month is August. Occasional incidents of drought occur in northern part of this state resulting in poor crop yields in these areas.

1.13 Transport and Communication

The main railway line (single track) coming from Lagos links at Kaduna with the branch line from Kafanchan, and continues through Zaria, where it branches out to Funtua, Gusau and Kaura Namoda, thus linking the state with major towns of Kaduna and Kano with railways. Sokoto State's trunk road network is relatively well developed with about 2,400km of paved roads, about 1,000 km of all weather feeder roads, and about 2,700 km of dry season motorable tracks. Sokoto town is served by an International Airport with daily flights to and from Lagos.

Electrical power from the national grid serves the largest towns and small diesel-operated units have been installed in many of the LGA headquarters. However, these sources are unreliable as demand for electricity far exceeds generating capacity, leading to wide spread voltage fluctuations and frequent power failures.

Rivers, lakes, ponds, shallow wells and springs are the main source of water supply for the majority of the population. Access to treated water supplies is low, and distribution systems are unreliable due to poor maintenance. To improve access to portable water in the areas of greatest agricultural potential, the Sokoto

Agricultural and Rural Development Authority (SARDA) has sunk about 1,200 bore holes. Sanitation is rudimentary. Pit latrines are the prominent means of faecal waste disposal. Shallow, unprotected and poorly maintained earth channels have been constructed to carry away storm water and sewage water in the more developed sections of urban areas.

Sokoto State telecommunication system is served by NITEL, a Government owned subsidiary. NITEL has recently been commercialised under the Government Programme of Privatisation and Commercialisation. It is hoped that a wider consumer area of Sokoto State will benefit from this new dispensation.

1.14 Economy

Agriculture is and has been the mainstay of the state's economy. As a result of the loan approved to fund the Sokoto State Agricultural Development Project, areas available for arable farming are being increased in the State to further develop the agricultural potential and raise farm production levels. Irrigation farming is gaining increasing prominence in the state river basin areas, with the two most notable dams/irrigation projects located at Bakolori and Goronyo. Other aspects of the economic sector include commerce, livestock (tanning industry), banking (including the indigenous Gamji Bank), furniture, cement, production, soft drink factory, ginnery, textiles, confectionery with many other potential projects in the pipeline. The state is also actively pursuing the tourist industry. The abundance of excellent Hotel facilities in the major towns of Sokoto and Gusau will enhance the attraction of the tourist sector.

1.20 Health Policy and Organisational Structure

1.21 Organisation

The organisation of the Health and Social sector in Sokoto State is similar to that of other states. Health Care Services are provided generally by the State Ministry of Health, the Hospital Services Management Board, Local Government Authorities (LGAs) private sector, NGO's and Traditional practitioners. For the purposes of administering Health Service more effectively the LGAs have been grouped into five zones, each being headed by a Zonal Health Coordinator in charge, who is responsible to the State Ministry of Health (See Annex 1V). The Ministry of Health develops and formulates policy, while the Health Services Management Board implements the policies on a day to day basis. Under the new Federal Ministry of Health guidelines, Local Government Authorities now take full responsibility for the day to day running of the Primary Health Care facilities (PHCs).The basic Health Services are provided through a network of Teaching, Specialist, and General Hospitals; and PHC centres.

1.22 General and Teaching Hospitals

The Usman DanFodio University Teaching Hospital (UDUTH) in Sokoto State was built to accommodate 600 beds and facilitate the training of doctors and medical staff from the University and Schools of Nursing. It was founded by the Federal Ministry of Health. A 400 bed hospital owned by the state Government is presently under construction in Sokoto and is expected to be completed next year. It is hoped that this will serve as a referral facility for the General Hospitals in the state.

It is hoped that this will serve as a referral facility for the General Hospitals in the state.

There are presently 5 General Hospitals in Sokoto State, the largest being a 400 bed facility situated in Sokoto town, while the rest vary from 200 down to 70 bed facilities. Each of these is equipped with all the facilities expected of a general referral hospital i.e. x-ray, operation theatre, laboratory, maternity, paediatrics etc. The PHC system is generally in good order. However, some centres are in need of upgrading to 50 t0 70 bed General Hospitals. These are in remote areas and the benefiting populace find it impossible to travel to the existing facilities.

1.23 Training and Institutions

Training Institutions and Scholarships are being re-addressed to maximise the effect of increasing manpower levels. The acute shortage of drugs that affected the Health System in 1986 has since improved. This can be attributed to the initiation of the Drug Revolving Fund (DRF) and the World Bank financed Sokoto Health Project (SHP). The DRF, being a cost recoverable venture and relatively successful, has of recent suffered a set back due mainly to Naira devaluation. In addition with the recent scourge of fake drugs on the market, the Government is in need of a Quality Control Laboratory to strengthen its fight against the scourge.

1.24 Private Sector

The private sector plays a complementary role in Sokoto State. However, it suffers from inadequate manpower levels created by the exodus of Kebbi State indegenes to the recently created (in 1991) Kebbi state.

1.25 Financing of Health Services

Cost recovery is constantly being re-addressed both at State and Local Government levels. Fees for drugs and services have been introduced and implemented successfully. However, the success rate will be far greater if the facilities are rehabilitated for maximum effect. The Public Health Sector is financed almost entirely from budgetary resources. Capital expenditure has been augmented over the years by the Federal Government and external finance. In the case of recurrent expenditure, the levels have been between 6% - 8% of the annual state budgets over the last few years. Government continues to look for ways and means of increasing its resources base to accommodate what it feels is a social obligation to the citizens of Sokoto State.

1.30 **Major Constraints In The Health Sector**

The quality of health services to the general populace is below expectation despite tremendous improvement in services over the years. Major constraints, though with varied emphasis from State to State, have striking similarities and are of common origin. These major constraints are:

1.31 Inadequate Infrastructural Facilities such as buildings, equipment etc. This problem is mainly due to the fact that the majority of the health facilities in the state were initially established to provide only some basic services to small communities. Although facilities benefit from piecemeal expansions and rehabilitations from time to time, their growth never matches that of the ever

expanding communities they have to serve. Also proper maintenance of structures and equipment are normally not taken as priority because of shortage of funds. The project has identified these areas and has provided funds for adequate rehabilitation and required expansion works including provision of new equipment and servicing of existing ones.

1.32 Presence of unserviceable, obsolete and sometimes over-utilised equipment within the system is another major constraint. In some case where equipment is available the manpower to operate and maintain it is lacking. This problem is mainly due to diverse sources of procurement for equipment which makes stocking of spare parts difficult. The project will tackle this through rationalisation of procurement sources for equipment to allow for training operators and maintenance personnel and ease stocking of spare parts. Also possibilities of centralisation of specialised equipment only in few places to allow for their optimum use and easy access to spare parts and maintenance works will be looked into. Further, creation of central maintenance unit and training operators for the whole state will be looked into.

1.33 Much of the primary and secondary health care services are overstretched by increasing demand on facilities and personnel. Some areas due to remoteness and lack of transport services need clinics and where other clinics are overstretched, upgrading is essential to accommodate ever expanding demand.

1.34 Another key constraint is shortage of manpower at all levels and by all sectors of Health Services. This is due to lack of high level facilities which are required to attract manpower especially to rural areas. However, the case of Sokoto State has been aggravated by the state creation exercise which has resulted in a mass exodus of high level manpower to Sokoto State. In addition the only School of Health Technology, already overstretched, is situated in the new Sokoto State. In order to improve numbers and quality, the Government has recently established a new School of Health Technology, and has encouraged LGAs to introduce training scholarships for students in all aspects of the medical and related fields.

1.35 One of the key factors which militate against the provision of good health care to the populace is the lack of basic health statistics for planning, monitoring and evaluation. This, in fact, has been highlighted as a national problem and is more acute at the state level. This problem will be addressed by a proposal to enhance the activities of statistics and research units at the state ministry level.

These factors are all indicated in the detailed description of projects to be undertaken and the consequent benefits to overall system of health care delivery highlighted.

2.10 Project Objectives

2.11 Rehabilitation of 5no. General Hospitals in the state, located at Sokoto, Gusau, Talata Mafara, Isa and Gumi; to enable them function efficiently as secondary care facilities and provide effective referral coverage for the PHC network in the state.

2.12 Upgrading of 6no. PHC centres at Wurno, Dogon Daji, Yabo, Anka, Illela and Kaura Namoda to 70 bed Hospitals to accommodate the growth of population in the respective areas.

2.13 Strengthening of operational and management systems being established for the maintenance of the physical plants and equipment of the selected facilities.

2.14 Strengthening the management information and referral systems in the selected facilities.

2.15 Strengthening of training programmes in certain key areas of the Health delivery system, such as management, referral, health auxiliaries and technicians, MCH/FP and maintenance.

2.20 Detailed Features of Project Components

The rehabilitation and upgrading works on the designated health facilities in the selected locations shall involve the following

2.21 Builders Works

Many of the building facilities in the designated health centres are quite old, generally in sound structural conditions but requiring extensive renovation works such as re plastering and repainting, substructure and flooring, replacements/repairs on doors, windows and roofing structures, etc. There are in addition identified needs for additional facilities such as new operation theatres, additional wards, walkways, X-ray departments, laboratory facilities and staff accommodation blocks.

For all 6 PHCs that are to be upgraded, additional facilities include ward, theatre, laboratory, X-ray, surgery and dental departmental blocks, as well as staff accommodation units.

2.22 Services

Power supply rehabilitation works shall include electrical re-wiring of buildings, provision of external lighting and A/C units for key buildings. The supply systems shall also be strengthened by the installation of standby generating sets.

The existing water supply systems shall also be strengthened with the provision of bore holes where applicable, along with under ground and over head storage tanks and the renovation of the reticulation systems. Other services shall include toilet fittings, tilings, as well as telephones and intercoms.

2.23 Infrastructure

Infrastructure to be provided shall include external water drainage, access and estate roads, parking, landscaping, security gates and fencing and estate lightings.

2.24 Equipment/Furniture

Hospital equipment in the designated centres shall be reviewed in detail by a separate bio-medical specialist in order to effect a complete rationalisation of equipment, and the procurement of additional requirements based on established criteria. Hospital furniture including beds, trolleys tables, desks, chairs, benches, fling cabinets, and shelves for storage areas etc., shall also be provided for the rehabilitated/upgraded facilities. Utility vehicles and ambulances shall also be procured.

Project Locations

2.31 General Hospitals (for rehabilitation)

- General Hospital, Sokoto (400 beds)
- General Hospital, Gusau (200 beds)
- General Hospital, Talata Mafara (100 beds)
- General Hospital, Isa (100 beds)
- General Hospital, Gumi (100 beds)

2.32 Primary/Rural Health Centres (for upgrading to 70 bed hospitals)

- PHC Yabo (20 beds)
- PHC Dogon Daji (20 beds)
- RHC Anka (20 beds)
- PHC Wurno (20 beds)
- PHC Illela (20 beds)
- RHC Kaura Namoda (20 beds)

Project Implementation

2.41 The Execution Agency

The Sokoto State Ministry of Health will be responsible for this project through a Project Implementation Unit (PIU) which will be established solely for the project. The cost of establishing the PIU and its running costs is provided for in this project. The Project Implementation Unit will be headed by a full time Project Manager. The Project Manager will be a Medical Personnel with relevant experience particularly in renovation and rehabilitation of health care facilities. He will be assisted by a fully qualified Architect/Quantity Surveyor, Hospital Equipment/Services Engineer, Accountant, Administrators and other necessary support staff. The Project Implementation Unit will be responsible to the state's Honourable Commissioner for Health. The Organisational Structure of PIU is as in Annex III.

A Multi-disciplinary Engineering Consultancy firm will be commissioned through an international recruitment on the basis of shortlist to design and supervise the execution of works in the project sites. The consultant who will be under the supervision of the PIU will be required to provide Regional Resident supervision staff. The cost of consultancy services is provided for in the project.

2.42 Procurement of Goods and Services

The Project Implementation Unit (PIU) will be fully responsible for procurement of all goods and services required by the Project. It is proposed that in order to facilitate the implementation of the project:

- All rehabilitation construction works be sourced locally through a selected shortlist
- All Services and Medical Equipment be sourced through international competitive bidding
- Design And Supervision for new projects to be sourced through a selected international shortlist.
- Drugs and Medical Consumables to be sourced through local shopping and/or UNICEF.
- Technical Assistance/Training to be sought through international bidding on basis of a shortlist.

Consultants commissioned to Design and Supervise the project construction and rehabilitation works shall be under the overall supervision of the PIU.

2.43 Programme of Implementation

The Project is expected to be implemented over a period of Four years, commencing from 1993. The procurement of equipment, furniture, training and technical assistance will be co-ordinated with the programme of construction and rehabilitation.

3.00 THE SERVICES

3.10 General

3.11 Sokoto State Ministry of Health wishes to engage the services of a multi disciplinary consultant for design and supervision services in construction and rehabilitation works covering all the project sites. The consultancy services shall include Architectural, Civil/Structural Electrical and Mechanical Engineering and Quantity Surveying services.

3.12 The Consultant shall be a multi-disciplinary consulting firm with capacity to provide the services of Architects; Civil, Structural, Electrical, and Mechanical engineers; and Planners; from the design to the construction supervision stages, on all the 11 locations across the state.

In addition it will be expected that the preperation of the tender documents will begin on each site with simpler structures so that the tendering in lots can be carried out in a staggered manner to ensure the continous flow of the implementation schedule.

3.13 The consultant shall be responsible for the design and supervision of construction works on all the designated sites. The consultant will be expected to update and utilize the exsisting drawings of sites/structures and the schedules of dilapidations that were preapred during the appraisal of the project by the ADB. In addition his services shall cover all works associated with normal stage I, II and III works as defined in the currently approved Conditions of Engagement of Consultants by the Federal Government of Nigeria in Architecture, Engineering and Quantity Surveying. These shall include among others:

Detailed Design

- Design and Production Drawings (includes the following;

  site lpcation plans to the scale of 1:5000
  master design plan to the scale of 1:25000
  site plan to the scale of 1:500
  cross-section/elevations of buildings to the scale of 1:200
  drawings indicating proposals to solve struc/environmental/physical problem factors.

- Tender Documents
- Capital and Operating Cost estimates
- Implementation Schedule
- Tendering and Analysis of Bids together with the client in line with the ADF procurement guidelines.
- Preparation of policy guidelines for the training of building maintenance personnel.

Supervision

- Construction Supervision and
- Cost Control
- Project Management

- Assistance in procurement and co-ordination of inputs by Contractors and Suppliers
- Start-up of facilities and their operations for an initial period

3.20 Functions of the Consultant

3.21 Prepare preliminary and final designs, along with all associated documentations in all fields of Architecture, Engineering and Quantity Surveying, based on the employer's requirements and where necessary co-ordinate the Specialist Consultants all in line with the approved project appraisal report.

3.22 Produce in detail, tender documents which shall include all necessary drawings, specifications, and bills of quantities; any special instructions to tenderers, carry out cost checks and inform the Employer from time to time as and when due of any major decisions which are required, and receive any amended instructions all in line with the approved project appraisal report.

3.23 Assist the Employer in the pre-qualification of Contractors and Sub-contractors for all International Competitive Biddings and local shopping, and advice upon a list of suitable firms to be invited to tender in line with the African Development Bank's guideline for the selection of Contractors and Suppliers.

3.24 Obtain, analyse and report on open tenders and advice on the Contract and the appointment of the works Contractors, arrange for them to take possession of site, examine and advice on their programmes of work all in line with African Developmental Bank's rules and guideline for the selection of Contractors and Suppliers. Prepare draft invitation for the prequalification of local contrators, draft contract documents and draft invitations to tender for equipment & furniture.
In addition confidential cost estimates indicating the brakdown into foreign exchange and local money components.

3.25 Provide resident site supervisors over the full period of the contract, inspect and monitor the works and ensure that specifications are complied with.
Advise on the best approach to applying a lump sum contract or measured works to each construction lot.

3.26 Upon request by the Project Manager, prepare and evaluate tender documents under ADB rules for the procurement of any additional services required for the effective implementation of the construction works programme.

3.27 Monitor and control cost of construction works within the allocated budget and notify the Project Manager should overruns appear likely. Also prepare regular progress and financial reports including cash flow for construction works for the Project Manager.

3.28 Conduct monthly site meetings with a view to assessing progress of work at which senior/management staff of the firm are expected to attend.

3.29 At each time tender documents for a lot or group of lots are ready, a draft is to be sent to both the client and the ADF in 2 copies for their comments and approval. Subject to these comments and approvals, final tender documents including

graphic components should be sent in 20 and 3 no. copies to the client and ADP respectively.

3.30 Responsibilities

3.31 The general responsibilities of the supervisory consultant shall be those given in the first schedule of the Nigerian Institute of Architects Conditions of Engagement Clause 22.1(a) to (i) inclusive, a copy which is attached.

3.32 A Consultancy Agreement will be entered into with the SOSMoH based on the relevant Conditions of Engagement of the Nigerian Institute of Architects. Among others it is intended that clauses 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, will be included.

3.33 Preparation of tender documents for rehabilitation, furniture and equipment should not take more than six (6) months.
The Consultant will be expected to strictly adhere to the work schedule agreed upon in his contract.

3.40 Implementation Methods

3.41 The Consultant, in submitting his proposal, shall give the names and CV's of the staff he proposes to use, and the reserve staff in hand for backup. The numbers and qualification of such staff will be the subject of further discussion and agreement with the SOSMoH in order to establish the most effective and economical staffing and travelling arrangements which will provide satisfactory multi-disciplinary supervision of the project.

3.42 A complete project team shall consist of an Architect, Civil/Structural, Mechanical and Electrical Engineers and a Quantity Surveyor. The project too can be zoned for easier administration, but each zonal unit must be manned by a project team. For each project assignment, professionally qualified personnel will be required. Personnel experience in supervision work will be essential.

3.43 The consultant will be expected to have an acceptable project office in Kaduna staffed with secretary etc. with which the SOSMoH can transact the week to week affairs of the consultancy agreement. The senior personnel/management staff of the consultant can be elsewhere but are expected to be available on a monthly basis and to be reasonably available by telephone/fax when needed.

3.44 The consultant shall provide for all necessary office facilities, housing, cars, and office support facilities as are normally necessary on such projects. This should be costed and included in the consultant's proposal as per his total requirement.

3.45 The construction and rehabilitation contracts are expected to be completed within a period not more than 52 weeks and a Defects Liability Period of 6 months or a rainy season whichever is longer; during which the Final Accounts will be prepared and agreed upon. The consultant is expected to note this and consider it in his financial proposal.

SOKOTO STATE NIGERIA

