

KINGDOM OF CAMBODIA

Ministry of Health

Complementary Package of Activities

BUILDING BRIEF - REFERRAL HOSPITALS

Foreward

These documents, the "**BUILDING BRIEF - REFERRAL HOSPITALS**" and, its annex, the "**TABLE OF FUNCTIONS AND FACILITIES**", are the result of the hard work of the Civil Works Group (CWG) of the Ministry of Health. Many other Ministry officials and advisors have also contributed to the development of this building brief.

In February 2003 the Ministry of Health completed the "Complementary Package of Activities – Guidelines for the Referral Hospital 2003-2007" (CPA Guidelines).

Now, six months later, the CWG has completed a document that translates the services described in the CPA Guidelines, into a building brief. Simultaneously the guidelines for "Standard Equipment for the Referral Hospital" are being finalized. These three tools will be invaluable in the continued improvement of Hospitals.

It is the first time that the Ministry of Health has produced a building brief such as this and it is intended to serve as the reference document for all future Hospital construction. However, it should not be considered like a "bible" but rather as a basic technical document that can continually evolve and integrate new data in accordance with the real situation.

The BUILDING BRIEF and its TABLE OF FUNCTIONS AND FACILITIES can be put to many important uses. They can serve as discussion documents with end-users to determine building requirements. They should enable stakeholders to understand the scope of works involved in funding Hospitals. They will assist the Ministry of Health in its dialogue with the civil works teams responsible for the next phases of design and construction.

The BUILDING BRIEF is the first step towards upgrading the design of Referral Hospitals to fit the CPA guidelines and to meet the minimum requirements of developing countries as recommended by the World Health Organization.

Especially, this work will contribute to the improvement of the country's Hospitals that are indispensable to support a high standard of health services.

Phnom Penh
Director General for Health

Prof. Eng Huot

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In addition to the contributions of the above Committee, many key staff of the Ministry of Health, Provinces and Districts as well as experts from non-governmental organizations have all contributed invaluable input to this Building Brief.

Sincere thanks to them all.

Note

The present building brief and its annexes (in particular the attached "Table of Functions and Facilities"), aims to contribute to improving the design of the Referral Hospital. It results from long meetings of the CWG: (Civil Works Group) and draws on many sources, of which:

- Complementary Package of Activities – *"Guidelines for the Referral Hospital for 2003-2007"*, Ministry of Health, Cambodia, February 2003
- District Health Facilities: *"Guidelines for Development and Operations"* WHO, 1998
- Daniel Dupety, WB Architect's recommendations, Dec 2002
- Completion Report, ADB project, Sheladia Assocs, August 2001
- Civil Works exit report, by Ang Narith, Sheladia Engineer, 25.4.2003
- HSSP Project Implementation Plan November 2002
- William Collins Ph.D *"A Study of Health Seeking Behaviour in Kampong Chhnang, Cambodia"*, 2000
- recommendations resulting from discussions with many Health Sector specialists and visits to existing facilities

Together with the Table of Functions and Facilities in annex 5, this document translates the services to be provided by the Referral Hospital, into a building brief that will assist the Ministry of Health in its dialogue with the civil works teams responsible for the next phase of design and construction (2003-2007).

The building brief is the first step towards upgrading the design of Referral Hospitals to the minimum requirements of developing countries as recommended by the World Health Organisation and to fit the CPA guidelines.

In years to come, as services are improved and elaborated upon, as more equipment becomes available and is supplied, this brief should be continually updated to take into account the upgrading of each CPA category.

1. OBJECTIVES

The main objective of the Health Sector Support Project (HSSP) is the improved delivery of health services for the benefit of the poor and rural population. This requires the continued development of primary health care facilities and first referral and provincial hospitals by realizing civil works (rehabilitation and new constructions), equipment and maintenance. By providing upgraded and new facilities, the aim is to instil more confidence in the general public and to encourage them to consult reliable public health services, also to improve the morale of health staff.

The purpose of this document is to provide all the persons involved in civil works, from Hospital Directors to Civil Works Engineers, Maintenance Engineers or Health Planners, with a document that translates the services described in the CPA Guidelines of the Referral Hospital into a building brief that should serve as a reference for all future Hospital construction, extension or rehabilitation.

2. BACKGROUND, PROJECT INITIATIVE AND FUNDING SOURCE

A joint donor Health Sector Support Project (HSSP) will be implemented between 2003 and 2007 in Cambodia. In addition to the Royal Government of Cambodia (RGC) funding will be provided by an Asian Development Bank (ADB) loan, World Bank (WB) loan and Department for International Development (DFID) grant.

This funding will contribute to the construction of many health facilities, including the upgrading or new construction of approximately 30 Referral Hospitals (14 ADB, 16 WB).

This activity is an extension of work done under a preceding phase of civil works.

The Ministry of Health has already developed a standardized Health Centre design with a Minimum Package of Activities (MPA). In addition, specifications for an elevated model (for use in flood-prone areas) were developed and approved. These standardized designs will continue to be used, but site-specific modifications may sometimes be required.

The Ministry of Health has also developed guidelines for the Referral Hospitals with 3 categories of hospital (CPA 1, CPA 2 and CPA 3) depending on the services to be provided (Complementary Package of Activities) and standard designs for new components of Referral Hospitals consisting of a number of modular buildings. Most of these Hospitals have existing buildings, some of which may be in a good enough state of repair to be renovated.

However, the majority of these buildings are not adapted to the level of health standards that Cambodia is striving to attain, and it is necessary to develop a standard design for a new Referral Hospital that will optimize funding and support the efforts to improve health services throughout the Kingdom. This will also require that attention be paid to the development of an organic site plan integrating the rehabilitated and the new buildings, incorporating walkways, trees and water basins as an integral part of the design.

The basic guideline for evaluating a Hospital's building size is the number of beds (or patients) and the services should be designed around this. According to the World Health Organization the total floor surface of the Referral Hospital can be derived from a ratio of 40M²/bed¹ i.e. a 105 bed hospital x 40 = 4200M².² This should be compared with a total of 2282M² provided for by the previous standard modular buildings.

¹ This ratio allows for all circulation space, waiting areas, and functions. It is valid for complete hospitals and should not be used to calculate the surface of a specific facility such as a 32 bed TB hospital that does not have the complex functions of a Referral Hospital.

² District Health Facilities: Guidelines for Development and Operations WHO 1998 p 9

2.1. The role of the Health Centres and the Referral Hospital

The role of the health centre is the first level of consultation with the Minimum Package of Activities "MPA" that covers curative care, preventive care and management within a radius of 10 km.

The role of the referral hospital is to serve an operational district on two levels – the two tier system - with a Complementary Package of Activities (CPA 1, CPA 2, CPA 3):

- to provide primary health care – diagnoses, in-patients, specialized consultations, emergency care, rehabilitation services, educational services (it does not favour 'drop-in' patients who should go to a health centre). Where a health centre does not exist within a 3 km radius from a Referral Hospital it should be provided within the Hospital where it serves as an out-patients consultation.
- to articulate the movement of patients between health centres and national hospitals

2.2. Referral Hospital buildings – past, present and future

Most of the Referral Hospitals exist already. Their buildings were built over a period of fifty years in some cases. Some of these can be integrated into the new design by being renovated, some have to be demolished or put to new uses, but this implies that each hospital has to be specifically planned.

This is why thorough surveys to evaluate the potential reuse of existing buildings are necessary.

As the Hospitals have to continue to function during the civil works, it will also require careful thinking to phase the work.

*"prior to this stage of the project, RH's have not been designed as individual hospitals but as "modules", themselves designed as individual unrelated buildings. Because of this there is no specific relationship between buildings or functions on specific sites. This is a problem, because site functions are compromised, consequently staff and patient efficiency and comfort can be improved."*³

This is the conclusion of the previous phase of works executed with the WB loan (1997-2002). The buildings have many functional problems. The PIP suggests that the individual building "modules" of the Referral Hospital be redesigned. *"This re-design work will maximize improved functional relationships as a matter of good efficient planning"*.⁴

³ PIP Annex 8 – Civil Works, p 2

⁴ PIP annex 8 – Civil Works p 2

It points to the shortcomings of the standard modular designs that were developed and to the necessity for the ongoing improvement of the Referral Hospital design. Efficient planning should result not only in more functional buildings but also in more cost effective buildings that optimize the standard.

The master site plan will play a major role in determining the successful design to consolidate functional relationships between the various departments of the hospital, *"to make the hospital more disease and infection free, efficient, practical and more environmentally acceptable for patients and staff alike."*⁵

However, a well-designed master site plan cannot solve all the inherent problems resulting from the standard designs as they stand today.

Once the Hospital is built and functioning, its needs will evolve continually. Therefore every two years a re-evaluation should be made and any additional buildings or internal modifications should be integrated into the master site plan.⁶

"The Master site plans, once agreed (and amended if necessary) and approved, are to be used as standard control documents for all future development in specific hospitals. No further development should take place without full and due consideration, justifiable changes and formal approvals from local and regional sanitary authorities."⁷

This recommendation has to be complied with to maintain the coherence of the Hospital as a whole.

These buildings are being constructed to last. Their quality has to project to a standard of health service that Cambodia does not yet have, but will soon possess.

⁵ PIP annex 8 – Civil Works p 4

⁶ PIP annex 8 – Civil Works p 4

⁷ PIP annex 8 – Civil Works p 4

3. PHILOSOPHY OF SERVICE – USER BASED

The focus of all these efforts to improve health services in Cambodia should be directed towards the end-users, and the patients in particular, and all future civil works should be based on a thorough understanding of their needs.

Obviously the Hospital's main function is to provide reliable health care. But basic services such as readily available good quality food, sanitation and laundry facilities contribute to the general well-being of all end-users. How can staff be expected to guarantee a 24 hour service if there is no place for them to eat or rest? It has been well-established that providing food to tuberculosis patients is a motivating factor for them to stay in the Hospital for the full treatment. If the Hospital does not have the management capacity to handle such services as good quality food, laundry, waste disposal, maintenance of buildings and gardens it can envisage contracting them out to private companies. Initially, all necessary facilities should be provided for in the civil works.

Before even considering medical requisites, human beings, whether they be patients, staff, administrators or visitors to the hospital, all share three basic needs; shelter, hygiene and food. These basic needs should be satisfied before any other criteria.

The patient has to return to his rightful place in the hospital services and building design – i.e. the patient is the "centre", the main user of the hospital. The medical and administrative staff are there to serve the patient.

The improvement of design is an ongoing process. The quality of civil works is an important factor that will contribute to offering low-cost medical services and efficient buildings.

Therefore before finalising any design work, thorough knowledge about the patients, medical and administrative staff should be collected. Identifying the health provider (public or NGO) is another important factor to take into account as well as the presence of any additional services within the hospital (rehabilitation for example). The end-users must be consulted during the design process.

End-users can also prove an invaluable source of information about practical matters such as annual flooding, the presence of mines or ordnance or local building practices.

Three categories of end-users can be identified. They are:

3.1. The patient

The hospital has to provide the patient with a service and a space that can be appropriated, that is reassuring and where he feels considered and respected.

Dr Collins behavioural study⁸ underlines the necessity to take into account traditional views about medical treatment in Cambodia in which the patient's preference is holistic; comprising of physiological, psychological and socio-cultural factors and not just specialist scientific factors. If these "customer preferences" are taken into account then the Hospital will be successful. If not, there is a real risk that people will continue to consult kru khmer and yiey mop rather than competent medical staff. The patient is the "raison d'etre" of all health facilities.

As stated⁹ patient care requires that:

- suitable provision for the personal comfort and safety of patients is made
- patient privacy and dignity are assured and protected

3.2. The staff, comprising medical, administrative and maintenance staff.

Identifying the different categories of staff, from the surgeon to the janitor, from the Hospital Director to the driver, from the Chief Nurse to the cook is necessary if we are to provide them with adequate space for their work. Here too the staff's real needs must be respected for them to work comfortably, efficiently and to remain motivated. If a 24 hour service is required, basic human needs such as shelter, food and a place to rest must not be forgotten. If staff are expected to wear clean uniforms then they require a place to change their clothes and to have them laundered. If maintenance of equipment is expected then a properly equipped workshop has to be provided.

The design of the hospital plays a supportive role in providing the staff with the right space for the right service. To function as a team and not a group of diverse services, the hospital needs to be designed to favour communications at all levels between members of staff.

For this second ADB/WB project, an ongoing effort to improve the Referral Hospital design is required, tending towards a more organic structured one. Pushing patients on trolleys hundreds of metres from one building to another is neither acceptable from the medical point of view nor is it cost effective.

Staff should be consulted not only for the valuable input they can make to the design but so that they recognize themselves in the "as-built" hospital. It is "theirs". They can appropriate it and use it to the full.

3.3. The patient's relatives and attendants

Traditionally in Cambodia, relatives accompany patients and take care of their clothes, food and general needs. The psychological support of attendants should not be underestimated. The equatorial climate facilitates the provision of

⁸ A Study of Health Seeking Behaviour in Kampong Chhnang, Cambodia, William Collins Phd 2000

⁹ CPA Guidelines for the Referral Hospital

adequate accommodation, at a minimum expense, for these valuable companions who contribute to patients' well-being and earlier recovery. As there is no specific budget to cover the cost of facilities for attendants, Hospitals should seek imaginative ways of satisfying their needs; by attributing an unused building as a shelter and providing ample sanitation and shower facilities. At the same time it is often necessary to have some rules about the number of relatives and attendants so as to avoid the hospital being 'invaded' by visitors.

4. STANDARD HOSPITAL DESIGN

There are many arguments in favour of standard hospital design:

- plans that are well understood by the MoH, that correspond to the CPA guidelines and with which health providers are familiar
- plans that do not need to be completely redesigned for each hospital with good cost control and lower civil works cost
- easier management and maintenance

However this does not mean that once an acceptable design has been reached there is no need to continue to improve it. Several problems are inherent to the existing standard plans of pavilion or modular type building:

- they tend to be designed on a 6 M grid structure into which the various functions do not necessarily fit conveniently
- there is bad circulation between different medical services
- they do not promote good human relations among the medical team
- there are unsatisfactory site plans with no connection between buildings
- there are high construction and maintenance costs due to the ratio of external walls (major works) to internal space, climate exposure etc.
- there is very low density that consumes a lot of land
- there is difficulty in maintenance of the site as a whole

There are also some advantages with the modular building.

- it is easy to add a new service to an existing hospital
- they reduce the risk of the spread of nosocomial germs
- they are easily accepted by rural society as they are a familiar style of building found in schools and other public services

Improvements on the existing pavilion style design can be made by better landscaping, taking more care in the general layout or master plan of the hospital, and connecting buildings with covered walk-ways. These solutions should be borne in mind. As regards new building or rehabilitation work, the latter tends to cost as much, if not more, than new building. Connecting badly located services with covered walk-ways not only costs a lot, is not necessarily effective in protecting people from gusty winds and monsoon rains, and consolidates a badly organized hospital in the long term.

Therefore the choice to rehabilitate rather than rebuild new facilities should be carefully evaluated.

All in all the advantages of modular buildings are outweighed by the advantage of a complete redesign of the referral hospital, especially since the "Guidelines for the Referral Hospital Complementary Package of Activities" were finalized in February 2003.

The "Guidelines for the Referral Hospital" Feb 2003 Ministry of Health indicate in detail the services to be covered under each Complementary Package of Activities (CPA). The Minimum Package of Activities (MPA) should be provided within the Referral Hospital compound by locating an Outpatients Consultations Unit in such a way that 'walk-in' patients spontaneously go there.

The CWG has decided to centralize certain services that were previously dispersed throughout the hospital departments.

These are as follows:

- Outpatients
- Emergency and Major Surgery (including caesarian sections)¹⁰
- Laboratory tests¹¹
- Imagery¹²
- Laundering and Sterilisation¹³
- House-keeping¹⁴

By centralizing these specialized services, they will be:

- more efficient
- easier to maintain
- more cost effective both in the deployment of competent staff and the amount of equipment per hospital

These centralized services, in addition to other services delivered by the Referral Hospital, constitute a number of "core" functions that should be developed in a coherent standard design applicable for all new RH's.

¹⁰ refer to Annex 5 "Table of Functions and Facilities" 1. CLINICAL SERVICES 1.3. Surgical Services & Operating Theatre

¹¹ refer to Annex 5 "Table of Functions and Facilities" 2. PARACLINICAL SERVICES 2.1. Laboratory

¹² refer to Annex 5 "Table of Functions and Facilities" 2. PARACLINICAL SERVICES 2.4. Imagery

¹³ refer to Annex 5 "Table of Functions and Facilities" 4. TECHNICAL SUPPORT SERVICES 4.2. Laundry/Sterilisation

¹⁴ refer to Annex 5 "Table of Functions and Facilities" 4. TECHNICAL SUPPORT SERVICES 4.3. Housekeeping

4.1. Standard design for CPA 2 & 3 – CORE SERVICES¹⁵

A standard core design¹⁶ should be developed for the following basic functions (the numbering refers to the Table of Functions and Facilities in annex):

1. CLINICAL SERVICES

- 1.1. Outpatients Consultations
- 1.2. Emergency Department
- 1.3. Surgical Department & Operating Theatre

2. PARACLINICAL SUPPORT SERVICES

- 2.1. Laboratory
- 2.2. Pharmacy
- 2.4. Imagery (X-ray Echography)

4. TECHNICAL SUPPORT SERVICES

- 4.1. Kitchen/Catering
- 4.2. Laundry/Sterilisation
- 4.3. House-keeping
- 4.4. Waste Management

Instead of a collection of modular buildings corresponding to each separate function it is proposed that these core functions be designed as a whole concept. This should make the civil works more cost effective but, especially, by improving the efficiency of the Hospital function, it should contribute to a higher standard of health services.

This design should promote:

- good functionality between the various medical services
- teamwork amongst the Hospital staff
- cost efficiency due to intelligent civil works, lower maintenance costs and higher density
- long term reduction in maintenance costs of the site as a whole, thanks to lower civil works maintenance and energy consumption
- sufficient flexibility for future extension

¹⁵ The Ministry of Health intends that all CPA 1 Hospitals be progressively upgraded to CPA 2

¹⁶ see Annex CPA 2 & 3 Functional Diagram

4.2. Standard design for CPA 1 – CORE SERVICES

The CPA 1's main difference consists in the absence of Surgical services but the CWG has expressed the aim to progressively upgrade all CPA 1 RH's to incorporate this. Only 3 of the planned Hospitals in the WB PIP are CPA 1. A standard core building for CPA 1 should also be designed comprising the following functions allowing for the addition of Surgical Services at a later date:

1. CLINICAL SERVICES

- 1.1. Outpatients Consultations
- 1.2. Emergency Services

2. PARACLINICAL SUPPORT SERVICES

- 2.1. Laboratory
- 2.2. Pharmacy
- 2.4. Imagery (X-ray Echography)

4. TECHNICAL SUPPORT SERVICES

- 4.1. Kitchen/Catering
- 4.2. Laundry/Sterilisation
- 4.3. House-keeping
- 4.4. Waste Management

4.3. Other design work

Comparing the "Table of Functions and Facilities" in annex 5 with the existing plans reveals many discrepancies and argues for a complete review of the design of all the facilities. This should aim at simple functional design, built with easily maintained building materials that result in a cost effective Hospital both in the short and long term.

5. GENERAL CRITERIA AND PROJECT EVALUATION

Prior to any design work the following factors should be taken into account:

5.1. USERS

5.1.2. Consulting the end-users

The Provincial and Hospital Directors, medical team and any NGO's who may be implicated in services either under the CPA guidelines or as additional services should be consulted. The existing hospital should be visited and patients' needs taken into account as much as possible. The level of coverage and the availability of current and future human resources should be collated and used to complete the "Table of Functions and Facilities".

5.1.3. Identifying the health provider and phasing of works

The health provider¹⁷ has to be identified and consulted before commencing any design work. Depending on the existing state of the buildings the civil works have to be phased:

- Phase 1 - demolition work, new building and landscaping
- Phase 2 – demolition or rehabilitation of existing buildings

This will enable the Hospital to continue to function while the new buildings are under construction. After completion of the new buildings, the staff and patients can move to these and the old ones can either be rehabilitated or demolished.

In the case of refurbishment without new building, a prefabricated shelter should be used to house patients and staff during construction work.

5.2. LAND PROPERTIES

5.2.1. Size of land

With respect of World Health Organisation standards, a one hundred bed hospital requires 4 hectares of land. This is a minimum and corresponds to the hospital area only, exclusive of staff housing and other facilities. If possible it should be larger to allow for future extension.

Exceptionally, in cases where pressure for land is high, and only after approval from the Ministry of Health, a higher density of building may be authorized.

5.2.2. Accessibility and environment

The land should preferably be on a major road to ensure easy access by ambulances and located centrally in a service zone with a radius of about 25

¹⁷ in some cases the health provider is the Ministry of Health, in others it may be contracted out

km. Attention should be paid to the use of neighbouring land to avoid conflicts of usage. If possible it should be grouped with other institutional facilities such as schools. The land should be free from the danger of flooding and nuisances such as noise and pollution.

5.2.3. Site master plan

The site master plan has to be carefully studied aiming at an organically designed landscaped ensemble integrating water basins, trees, covered walkways, the best possible adaptation of existing buildings and integration of new ones. The orientation of the buildings will be chosen preferably with long facades facing north and south (for the least direct sunlight and good cross ventilation). Attention will be paid to improve the "user-friendliness" of the facilities by considering the circulation.

5.3. INFRASTRUCTURE

5.3.1. Infrastructure

The site should have telecommunications, mains electricity and water supply, or should be in an area where such services are planned in the near future. An abundant and high standard of water is particularly important. If such utilities are not available substitutes should be adequate (radio, generators and/or solar electricity, wells and/or rain tanks).

5.3.2. Electricity supply

This can be provided by mains electricity, electric generator and/or solar panels. All facilities should be provided with separate electrical circuits with high capacity cable and wiring. All highly equipped facilities (ICU, Operating Theatre, Labour room, Laboratory, Imagery etc. etc.) should have adequate electrical infrastructure for the equipment used with earthed plugs every 2 metres. In some cases this implies tri-phase. In all circumstances the electricity supply should be stable 220-240 V.

5.3.3. Water supply

Before envisaging the construction or refurbishment of a hospital the potential ground and surface water supply should be evaluated and tested. In Cambodia, it is practically inconceivable that insufficient water not be available due to the high rainfall in all areas. The hospital should have abundant clean cold water. Drinking water and water used for medical equipment may have to be treated or brought in from outside.

5.3.4. Waste disposal and waste water treatment

The design of the Hospital should take into account effective waste disposal, and waste water treatment with respect of environmental rules.

5.3.5. Telecommunications

Where possible provide fixed telephone lines, (one for internet connection¹⁸, another one for calls); if not, mobile phones. In remote areas provide radio phone for link up between hospital and health centres. This requires a 50M high mast equipped with an aerial and lightning conductor installed close to the emergency room.

5.4. BUILDINGS

5.4.1. Accessibility and signage for vehicles and externals

The Referral Hospital is to be accessible by ambulances with good signage in Khmer and English. The emergency unit should be easy to locate. Out-patients consultations should also be clearly signed.

5.4.2. Accessibility and circulation of people

All hospital buildings are to be accessible by handicapped people. This may require access ramps equipped with hand-rails and a maximum gradient of 5 degrees. All doors should be double, at minimum with one 90 cm and one 30 cm, totalling 1.20M. Emergency fire fighting vehicles must be able to approach all buildings. Fluid movement of patients should be guaranteed in all facilities. This requires wide corridors and doors and simple circulation. Separate accesses for staff and patients, ambulances and private vehicles should be taken into account as well as delivery vehicles of equipment and medical supplies.

5.4.3. Internal communications

An internal electronic communications system (or staff messenger) should be installed for medical staff but also an emergency call system for patients.

5.4.4. Signage of all facilities

Clear signage should facilitate locating services including labelling of all doors.

5.4.5. Climatic criteria

The whole of Cambodia has a hot equatorial climate with a Northerly hot dry monsoon half of the year and a Southerly hot wet monsoon the rest of the year. The mean temperature only varies 10 degrees from the average lowest to the average highest.

However, three distinct climatic zones can be distinguished:

¹⁸ it may be a good idea to install the internet connection in the library where it can provide access to website medical information

- the low-lying flood plain of the Mekong River that covers approximately 80% of the country
- mountainous regions such as Mondulhiri and Rattanakiri where the temperature can be considerably lower (up to 10 degrees less)
- the Southern coastal zone that is sometimes exposed to severe storms

Buildings should be designed to take into account these local climatic criteria using natural ventilation, shade, the best orientation (usually North/South), protection from heavy rain and knowledge of dominant winds for good ventilation. Knowledge of dominant winds is also important for locating isolation wards to avoid spreading germs. In regions exposed to storms, the roof structure should be calculated to take into account the wind factor. The minimum ceiling height will be 4M to guarantee comfortable natural ventilation at all times (maybe less in exposed coastal zones). All facilities will be designed for natural ventilation except where otherwise specified. In flood prone areas buildings should be elevated 2 metres from the ground to avoid seasonal flooding.

5.4.6. Sanitation

All facilities should be equipped with water based sanitation separate for staff and patients. Squat toilets should be provided and basins equipped with hand-free taps. Wards should be equipped with showers and toilets. Latrines are not an acceptable form of toilet for a modern hospital.

5.4.7. Building materials

Locally produced building materials of an acceptable standard should be identified and used whenever feasible.

All facilities susceptible to be dirtied by contaminated waste or body fluids, (especially toilets, operating and delivery rooms, laboratory and sterilization unit) should have wall and floor finishes resistant to chemical attack and be equipped with floor sumps.

In no circumstances should internationally unacceptable materials be used (e.g. any composite material comprising asbestos). In the case of demolition works involving such materials they should be disposed of with respect of environmental rules and regulations and with regard to the precautions necessary to protect workers from contamination.

5.5. SERVICES

5.5.1. User-friendly – guest accommodation

The hospital should be user friendly and provide easy access for visitors and relatives, including temporary accommodation, protected places for cooking and

washing. Better still, an efficiently run canteen can provide food for all users, including passers-by. A small shop could provide toiletries and various articles.

5.5.2. Food for staff and patients

Good quality food should be supplied for patients, staff and visitors. In the case of TB treatment, providing food is an incentive for patients to respect the constraint of treatment lasting 20 – 30 days. In the case of staff readily available food can be vital to maintaining them in situ. A hospital restaurant located in a strategic central place can be both useful for providing meals to staff and visitors and function as a hub for informal communications that will improve the hospital teamwork.

5.5.3. Education

Education is an important support area and adequate education and training rooms should be provided in the plans. These can be strategically located and equipped with audio-visual material. A library for health literature should be provided. If possible an internet connection should be located in the library. Educational material can be exhibited for the general public in strategic locations such as the referrals consultation area.

5.5.4. Training

Meeting rooms that can also serve as "class-rooms" should be provided.

5.5.5. Technical support

Catering, house-keeping, centralized sterilisation and laundering should be organized so as to function effectively in the provision of food, cleaning, and supplies for all the Hospital. A manned workshop should be provided to maintain equipment and to do any everyday building repairs, install and move equipment to suit the medical requirements.

5.5.6. Administration

This can be divided into 2 different locations:

- a) one in close contact with the public for patients records, cashiers etc., directly in proximity to admissions
- b) one more private for hospital management – this does not need to be located in a central location

5.6. EQUIPMENT

5.6. Equipment

All facilities should be designed to take into account the specific requirements of medical equipment, as defined in the "Standard Equipment for the Referral Hospital", Health Services Department of the Ministry of Health – December 2003. Except where otherwise indicated in the "Table of Functions and Facilities" all equipment is mobile.

6. TECHNICAL DATA TO BE PROVIDED

The following is standard information to be provided to the Civil Works Group prior to preparing the complete design and tender documents.

6.1. Reference

Each facility will be given a reference number composed of the Provincial Number, the Operational District Number and the specific health facility number.

6.2. Site Information (see **ANNEX 1 Location plan**, showing the location of the health facilities in relation to village, town and road networks including the UTM facility coordinates)

6.2.1. SIZE OF LAND

According to WHO standards, a one hundred bed hospital requires 4 hectares of land. This is a minimum and corresponds to the hospital area only, exclusive of staff housing and other facilities. If possible it should be larger to allow for future extension. (refer to 5.2.1. above)

6.2.2. ACCESSIBILITY AND ENVIRONMENT

The land should preferably be on a major road to ensure easy access by ambulances and located centrally in a service zone with a radius of about 25 km. Where applicable, the project should be developed taking into account rural development and road construction projects. Attention should be paid to the use of neighbouring land to avoid conflicts of usage. If possible it should be grouped with other institutional facilities such as schools. The land should be free from the danger of flooding and nuisances such as noise and pollution.

6.2.3. INFRASTRUCTURE

The site should have telecommunications, mains electricity and water supply, or should be in an area where such services are planned in the near future. An abundant and high standard of water is particularly important. If such utilities are not available, substitutes such as wells must be feasible.

The following site information has to be completed for each individual facility:

1. physical description and land title
2. land use in adjoining areas
3. limitations of the site (water and electricity supply)
4. the presence of any landmines or unexploded ordnance, if necessary de-mining certificate
5. the presence of any ancient ruins or artefacts
6. maps of vicinity, landmarks
7. existing utilities
8. nearest city, port, airport
9. rainfall and data on weather and temperature

From the onset of the study the potential for the site should be evaluated. The Consultant responsible for civil works should report to the Ministry of Health if

the above conditions are not complied with, before going any further in the design process.

6.3. Site Survey (see ANNEX 2 Survey, showing the physical features of the site) The following information has to be completed for each individual facility:

- 6.3.1.** land boundaries, cardinal directions, GPS and topography, usage of neighbouring land
- 6.3.2.** existing buildings, infrastructure, vegetation and any other features, presence of water
- 6.3.3.** an evaluation of the potential reuse of existing buildings should be made. Buildings that cannot be rehabilitated as hospital facilities may be useful as garages, laundries, stores, temporary accommodation or workshops. If they are unsafe they must be demolished but it should be considered whether some of their building components can be recycled.
- 6.3.4.** information about flooding. A site with no apparent drainage problems when bare may be subject to serious flooding when developed if adequate provision is not made for disposal of rainwater.
- 6.3.5.** check soil conditions and resistance.

6.4. Hospital Operations (see ANNEX 3, Diagram showing the planned development)¹⁹

The size of the site in relation to the number of beds should be checked e.g. a 100 bed Hospital requires a site of 4 hectares (400M2 per bed). This is the hospital area only not including any staff housing. The diagram takes into account all the facilities described in the "**Table of functions and Facilities**" (**SEE 6.6. below**) as well as the following:

1. patient movement
2. staff movement
3. medical services
4. administration
5. accommodation for staff when applicable
6. vehicles movement
7. delivery of supplies
8. disposal of used goods
9. laundry services
10. food services
11. domestic services (electricity, water supply and disposal, refuse disposal)
12. security
13. engineering services
14. fire protection
15. emergency alarm systems

¹⁹ refer to CPA2 & 3 Functional Diagram in annex

16. security

6.5. Site plan (see ANNEX 4, Master Site Plan showing the planned development)²⁰

The site plan should be carefully studied to create an organically designed landscaped ensemble integrating water basins, trees, vehicle circulation, walkways, the best possible adaptation of existing buildings and integration of new standard buildings taking into account the tropical climate and dominant winds. Natural features of the site should be taken into account, especially any existing trees, water reservoirs or ponds, topography, roads and fences. The orientation of the buildings will be chosen preferably with long facades facing north and south (for the least direct sunlight). Infrastructure such as the location of sewage treatment, water supply, electricity supply and waste disposal should also be located. Landscaping features will be incorporated into the site plan and specifications.

Where possible future expansion (phasing) will be taken into account in the design of the master plan.

6.6. Table of functions and facilities (see ANNEX 5, showing commented schedule of accommodation with dimensions etc.)

This describes the building requirements to satisfy the services described in the "Guidelines for the Referral Hospital" February 2003. This is a quantitative table of functions and all the building facilities to be provided. It should be adapted to each specific Hospital for which civil works are programmed, either for rehabilitation or new construction. This table was designed by the Civil Works Group (CWG) of the MoH between July and October 2003. As specified in their meeting of 23.9.03 "the building brief must take into account the potential upgrading of each CPA category". As these evolve, as they will do, so should the building brief – and the table of functions and facilities.

Constraints such as specific activities, wheeled traffic, goods or material, special uses and work flow should be commented.

This table has been designed as a check-list or working document for discussions with end-users to determine the specific needs of each Hospital in view of completing the information.

Comments about the following constraints, where applicable, should be included in the table:

1. privacy, supervision, security, fire protection
2. environment, wind direction, lighting natural and artificial, heat humidity sterility, cold rooms, sound, ventilation
3. fixed and movable equipment

²⁰ refer to CPA2 & 3 Organization Chart in annex

4. electricity, water, ventilation and air-conditioning
5. flexibility and future extension

6.7. Preliminary design (see ANNEX 6, showing standard plans for the buildings, and where applicable sketch plans of buildings to be rehabilitated)

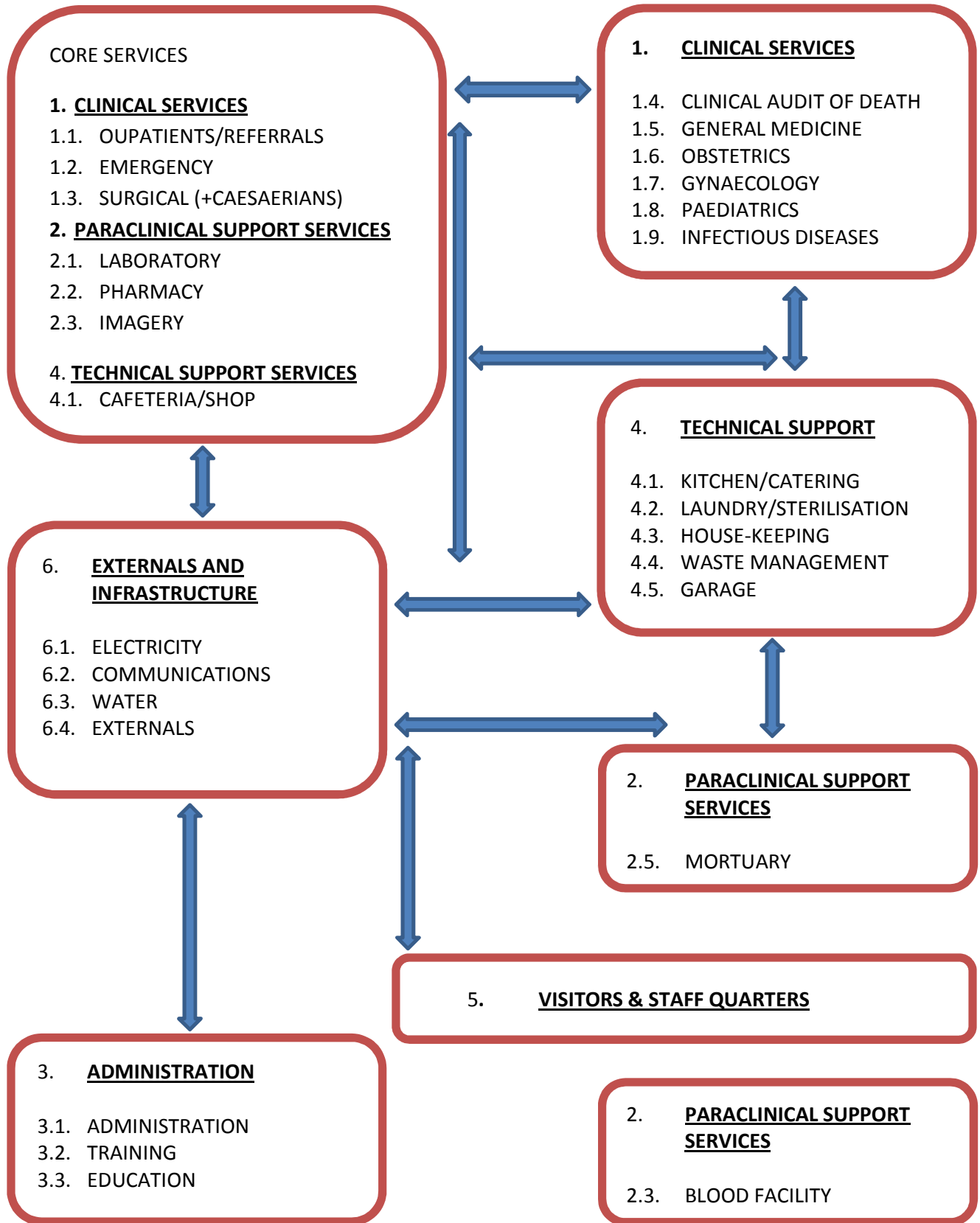
6.8. Cost of civil works and equipment

Approximate cost expectations should be indicated.

This information should be provided to the Civil Works Group of the Ministry of Health before proceeding further with the design of the Hospital.

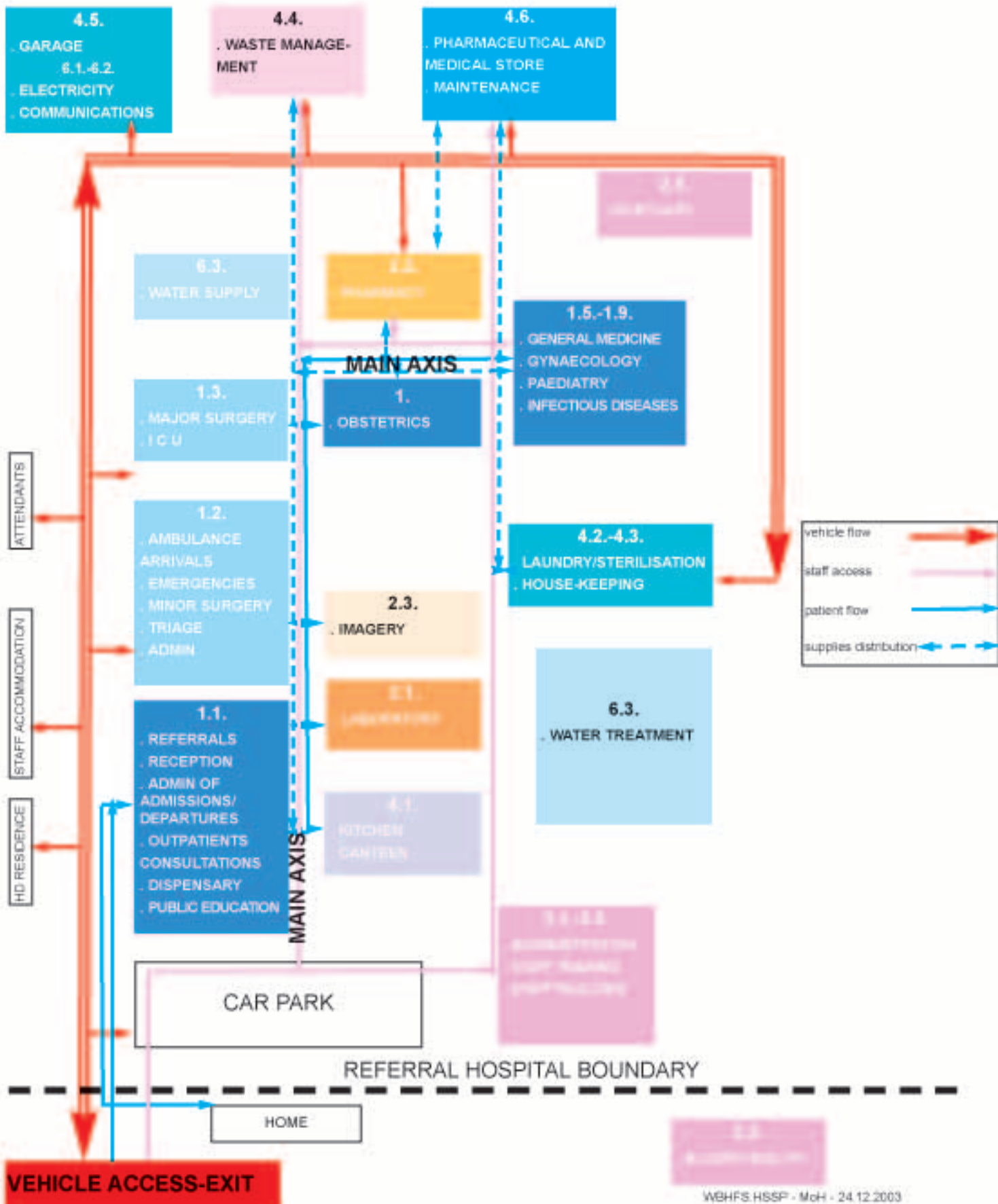
CPA 2 & 3

FUNCTIONAL DIAGRAM



CPA 2 & 3

RH CPA 2 & 3 ORGANISATION CHART



1. CLINICAL SERVICES										
1.3. SURGICAL SERVICES DEPARTMENT & OPERATING THEATRE										
					Mechve	Air-				
		Staff	Patients	Beds	nt	nt	con	Spec Eq	M ²	TOTAL M ²
		Minor surgery can be performed at all referral hospitals. CPA 2 and CPA 3 hospitals will have major surgical capabilities. The intensive care unit will provide constant medical attention (with specialized equipment) to critically ill patients, such as to control bleeding, to support breathing, to control toxæmia and to prevent or address shock.								
CPA 2 & 3		The surgical unit should be accessible from the 4.2.2. Central sterile supplies, the 1.2. Emergency department and from 1.6. Obstetrics. It should be adjacent to the intensive care unit in a cul de sac with no through traffic. Direct access to 2.4. Imagery unit is required. The circulation of soiled equipment and medical supplies should be separate from clean (linen, people, utensils) All operating rooms should have wall and floor finishes resistant to chemical attack.								
	1.3.1.	Consultation office for patients/relatives								
	1.3.2	Meeting room for pre-op medical staff								
	1.3.3.	Patient preparation room - pre-operation								
	1.3.4.	Aseptic Operating theatre (with anaesthesia) complete with changing rooms, scrubbing up facilities for two staff and sluice (proximity to emergency minor operating block in 1.2.9.) Roof structure and ceiling design to take into account operating light-fittings. Design should guarantee positive air pressure and be equipped with an air-purifier.								
	1.3.5	Instrument cleaning-up, washing-trap. Centralized autoclave and sterilisation room in 4.2.2.								
	1.3.6.	Patient recovery room - post-operation								
	1.3.7.	Intensive care unit (6 beds minimum to justify sophisticated equipment). The Intensive Care Unit is aseptic, highly equipped, and should be located adjacent to the operating block (1.3.4.). It is exclusively destined for critically ill patients who need constant medical attention. They come either from the operating theatre from wards or the admissions of the hospital. Patients who require long-term intensive care should be referred to a higher-level hospital.								
	1.3.8.	Surgical ward for up to 50 patients per month, either under observation or post-operation treatment. Requires space for resuscitation equipment, oxygen etc.								
	1.3.9.	Nursing duty admin room with controlled drug storage and drug preparation areas. It can also be used as a meeting and rest room for 24 hour staff (to be shared with emergency services 1.2.13.)								
	1.3.10.	Sanitary and shower facilities for staff (to be shared with emergency services) with lockers and changing room								
	1.3.11.	Store - technical equipment, laundry & medical supplies								
	1.3.12.	Store - house-keeping								
		TOTAL NET SURFACE								
		ADDITIONAL 20% FOR ACCESSORIES AND CIRCULATION								
		TOTAL SURFACE - SURGICAL SURFACES DEPT								

379.2

1. CLINICAL SERVICES										
1.4. CLINICAL AUDIT OF DEATH										
		Staff	Patients	Beds	Mech Vent	Air-con	Spec Eq	M ²	TOTAL M ²	
		see Mortuary 2.5.								
1.5. GENERAL MEDICINE DEPARTMENT										
		Staff	Patients	Beds	Mech V	Air-co	Spec Eq	M ²	TOTAL M ²	
		<i>The Internal Medicine, or General Medicine, unit will provide care for medical conditions for adults.</i>								
CPA 1, 2 & 3		This ward should be divided up into several units - men/women - chronic/acute disease etc.								
	1.5.1.			8				42		
	1.5.2.			8				42		
	1.5.3.			8				42		
	1.5.4.			8				42		
	1.5.5.							12		
	1.5.6.							20		
	1.5.7.							8		
	1.5.8.							12		
	1.5.9.							10		
	1.5.10.							3		
		TOTAL NET SURFACE							233	
		ADDITIONAL 20% FOR ACCESSORIES AND CIRCULATION							46.6	
		TOTAL SURFACE - GENERAL MEDICINE DEPT								279.6
1.6. OBSTETRICS (& GYNAECOLOGY DEPARTMENT)										
		Staff	Patients	Beds	Mech Vent	Air-con	Spec Eq	M ²	TOTAL M ²	
		<i>The obstetrics service is responsible for the provision of good quality curative care and delivery for all women, health education on lactation management, family planning, nutrition, newborn care.</i>								
CPA 1, 2 & 3		CPA 1 is equipped for an estimated 1.000 deliveries p.a. CPA 2 & 3 have over 2.000 deliveries p.a. Ambulance access should be provided. This department ensures 24 hour service. The delivery rooms practice aseptic procedures and should be next to the labour and recovery rooms, with direct access to the newborn care unit. This service should be separate from gynaecology. It has easy access to the operating theatre and intensive care unit (surgery), a newborn care unit, neonatal resuscitation equipment weighing equipment and measures. Also easy access to X ray and echography and ECG. Ante natal policy in "outpatients". Delivery rooms should have wall and floor finishes resistant to chemical attack.								
	1.6.1.							12		
	1.6.2.							12		
	1.6.3.							20		
	1.6.4.			3				20		
CPA 2 & 3	1.6.5.							50		
	1.6.6.							15		
	1.6.7.							15		
	1.6.8.			2				12		
	1.6.9.			20				80		
	1.6.10.							12		
	1.6.11.							8		
	1.6.12.							12		
	1.6.13.							10		
	1.6.14.							3		
		TOTAL NET SURFACE							281	
		ADDITIONAL 20% FOR ACCESSORIES AND CIRCULATION							56.2	
		TOTAL SURFACE - OBSTETRICS DEPT								337.2

5. VISITORS AND STAFF QUARTERS									
CPA 1, 2 & 3		In rural areas the provision of accommodation for the staff is indispensable, but it should remain strictly under the control of the administration who should determine which hospitals qualify for such facilities. Families and attendants play an important role in caring for patients and should be provided with shelter and sanitation.							
	5.1.	Residence for Hospital Director							
	5.2.	Medical staff accommodation							
	5.3.	Accommodation for visitors, trainees and attendants							
6. EXTERNALS AND INFRASTRUCTURE									
6.1. ELECTRICITY									
		<i>The electrical systems within the facility will be convenient and designed for the safety of both patients and staff, to International standards, and these will be integral to the building plans of the hospital. The electrical and water installations are closely connected, as water needs energy to be pumped. Therefore the two should be studied conjointly. Cambodia's standard distribution is 220-240 V.</i>							
		In all circumstances at least two sources of electricity are required to guarantee back-up in case of failure. Mains supply and generators: As is often the case if electricity mains supply is not available, other sources need to be used to generate a stable and sufficient supply in the form of generators (usually 25kVA for an 80 bed hospital). Even when mains supply is available, emergency generators have to be provided to ensure continuous functioning of medical equipment and services. In remote areas hospitals may be tempted to rely entirely on fuelled electricity generators, but even this is not totally reliable as there are often problems in procuring fuel due to lengthy administrative procedures or bad roads. Alternative sources: All these factors argue in favour of turning to one of the most readily available sources in Cambodia – the sun. The Cambodian climate lends itself ideally to solar energy and although the initial investment is high, cost analysis over a period of five years demonstrates its cost effectiveness in the long term. Maintenance and running costs are also low. Distribution: All facilities should be provided with a sufficient number of electrical circuits to take into account specific equipment requirements. All plugs should be earthed.							
		Cost-effectiveness: For each hospital, the cost-effectiveness of various different solutions should be studied before deciding on the best choice. In some cases specific functions such as water-pumps or air-conditioning of the operating theatre, laboratory and pharmacy store, can be envisaged with solar energy, even if the whole Hospital were not equipped.							
CPA 1, 2 & 3	6.1.1.	When possible install mains electricity supply							
	6.1.2.	Electricity generator to guarantee stable electricity supply and/or back-up (usually 25kVA generator for 80 bed hospital) Can be housed in Garage or Maintenance Building							
	6.1.3.	Envisage solar panels to complement electricity supply, or in certain cases generators to complement solar energy							
	6.1.4.	House in appropriate easily accessible building (garage, workshop etc.)							
6.2. TELECOMMUNICATIONS AND INTERNAL COMMUNICATIONS									
CPA 1, 2 & 3		<i>Telecommunications are evolving every day in Cambodia and available systems are likely to change fast over the next few years. All hospitals require 24 hour a day communications with District Health Centres. Adequate solutions should be found for each location.</i>							
	6.2.1.	Where possible provide fixed telephone lines, (one for internet connection , another one for calls); if not, mobile phones. In remote areas provide radio phone for link up between hospital and health centres. This requires a 50M high mast equipped with a lightning conductor. Install close to the emergency room.							
	6.2.2.	An internal electronic communications system (or staff messenger) should be installed for medical staff as well as an emergency call system for patients.							

6. EXTERNALS AND INFRASTRUCTURE									
6.4. EXTERNALS									Spec Eq
CPA 1, 2 & 3		<p><i>Good master site plans and quality site works make a considerable difference to the quality and functioning of the Hospital as a whole. Locating vehicle access carefully for the different departments, providing protected walkways, and siting the buildings of the Hospital well are factors to make it more efficient, more pleasant, and more successful.</i></p>							
	6.4.1.	Fence should be simple but well built to need low maintenance							
	6.4.2.	Gate should measure at least 4M wide (2x2) and be well designed to need low maintenance. The entrance and exit should be by the same gate for security purposes.							
	6.4.3.	<p>Landscaping should be carefully thought out for the beautification of the site but also for easy maintenance, taking into account trees for shade to buildings to improve climatic response, water basins for heavy rain disposal and as reservoirs, the choice of appropriate materials for walkways etc. Planting is an important aspect of efficient building and site design. The provision of shade trees supplements building design by assisting in the formation of "cool" areas and providing shade for the external walls of buildings, thus making them cooler. They also improve the general aspect of the Hospital as shady, informal, external meeting places. Appropriate finishes should be chosen for external places, pathways, gutters and roads.</p>							
	6.4.4.	Signage should be clear at all levels from external signage to indicate the presence of the Hospital to signage to the emergency and outpatients. All facilities should be clearly signed.							
	6.4.5.	Access road - the internal vehicle circulation should be carefully studied to separate the circulation of vehicles from people. Adequate finishes and drainage should be incorporated in the construction.							
	6.4.6.	Car park - provide adequate parking space for cars and motorbikes at strategic places in the site design.							
	6.4.7.	Paths. In the case of modular buildings they can be connected by covered walkways. They should be finished with adequate easily maintained materials and drainage.							
	6.4.8.	External lighting - especially of access roads and entrances to buildings should be provided							
TOTAL APPROXIMATE SURFACE OF RH									4380.8