DESIGN REPORT

STATE MOSQUE BAGHDAD

AMANAT AL ASSIMA  PROJECT NO 651/328  JANUARY 1983
STATE MOSQUE - BAGHDAD

COMPETITION DESIGN REPORT
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This submission is made further to an invitation from R. Chadirji, Counsellor to Amanat Al Assima, reference no. 3293 on the 21st July, 1982 and subsequent selection by the committee to participate in a limited competition for the design of a State Mosque in Baghdad as notified by telex on 23rd September, 1982. Project no. 651/328.

Information received by telex and interim briefings on 22nd November, 1982 have, combined with the written brief, produced many stimulating ideas the synthesis of which are contained in this submission.

The submission includes a design report; an architectural model at 1:500. The presentation consists of drawings and perspectives on 18 one metre by one metre panels comprising the following:

- Site plan at 1:100.
- Maps and concept analysis diagrams.
- Floor plan of site at 1:500.
- Detail design of mihrab at 1:100.
- Detail design of wall bay at 1:100.
- Elevations and sections at 1:500.
- Aerial perspective.
- View of mosque from main entrance.
- View of entrance to mosque.
- Interior view towards mihrab.
- Interior view of wall bay unit.
- Environmental sketches.

The requirements for the State Mosque as proposed are as follows:

1. Capacity: 26,000 persons.
2. Female prayer area for 3,000 persons.
3. An open air prayer area for 4,000 persons.
4. Library for 100,000 books and 50,000 manuscripts.
5. Carpark for 1,200 cars and 120 buses.
6. Accommodation for approximately 40 staff.
7. Daily prayer area for 1,000 persons.
8. Meeting room for 300 persons.

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4. Library for 100,000 books and 50,000 manuscripts.
5. Carpark for 1,200 cars and 120 buses.
6. Accommodation for approximately 40 staff.
7. Daily prayer area for 1,000 persons.
8. Meeting room for 300 persons.
10. Meeting room for 800 with a wing for 200 women.
11. Teaching institute of 10 classrooms.
12. Institute of 6 classrooms for Koran study.
13. Dining room for 500 with suitable kitchen facilities.

Suggested additions to the proposed requirements:
2. Malls (Kaisariat): for book binders, booksellers, calligraphers etc.
3. Malls (Kaisariat): for traditional craftworks as prayers rug, weavings (Zanabeel, Hisran etc.), pottery etc.
4. Thursday Market.
5. Sport and recreation spaces: for traditional (fencing, sword dancing, Zorkhana) and for modern sports.
6. Amphitheatre.
7. Picnic areas.
8. Traditional coffee shops.
9. Housing.
INTRODUCTION

The statement of the purpose and objectives of the competition as set out in the competition brief clearly summarises all the aspirations to be considered by a designer when approaching a task of such magnitude and importance. It is worth repeating in full these criteria:

"The creation of a State Mosque in the capital of the Republic of Iraq is a historic event. Its design and construction will be the highest expression in creative and physical terms of the religious, state and national beliefs and aspirations of the people of the Iraq and their leadership.

A State Friday Mosque is created to provide a worthy monumental frame and setting for the expression and practice of the beliefs and aspirations of Islam. Throughout the Islamic world such settings, when they are being created, synthesise the history and heritage of Islam with the contemporary quality of life.

The current resurgence in the city of Baghdad harkens back to the Round City of Al-Mansour, capital of the Abbasid Empire, and is a time of such creative and physical terms of the religious, state and national beliefs and aspirations of the aspirations to be considered by a designer when approaching a task of such magnitude and importance.

It is worth repeating in full these criteria.

This synthesis in the form of a mosque will become a living extension of the beliefs of Islam, entering the heritage and tradition of Islamic life for future generations.

Thus the presentation of the purpose and objectives of the competition as set out in the competition brief clearly summarises all the aspirations to be considered by a designer when approaching a task of such magnitude and importance. It is worth repeating in full these criteria.

The traditions and heritage of Islam are as rich and complex as human life itself. It is not the purpose of this programme to specify a set of requirements for the expression of such a wealth of physical, intellectual and spiritual needs and expectations. This is the intention, rather, that diverse and expert teams of architects and historians from both in and outside of Islam and Iraq will synthesise and propose architectural concepts and solutions reflecting a creative and physical terms of the religious, state and national beliefs and aspirations of the aspirations to be considered by a designer when approaching a task of such magnitude and importance.

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These concepts reflect the philosophy of our design approach.

Chapter one explores the status of Iraq and Baghdad in history.

Chapter two examines the choice of a site for a State Mosque and its relationship to the Baghdad of today and the Baghdad of the future. These concepts are presented as a series of maps.

A philosophy of a design approach is summarised in Chapter three.

Chapter four presents our approach to the spatial concepts by analysing the design as a series of site plans.

In Chapter five we approach the elements of a State Mosque Complex — dome, mihrab etc. Each element is treated as an entity relating to the whole. A visual montage seeks to record our conceptual approach to each element of the design by synthesising concept, idea, influence and metaphor.

These chapters illustrate a philosophy of approach and a series of concepts around which can be built the complexity of details necessary to elaborate the scheme into a further design stage.
CHAPTER 1
BAGHDAD
AN HISTORICAL PERSPECTIVE
The heritage of a country is the rock from which today's generation looks forward to the future. An awareness of past history, sociology, religion, culture and environment is the stable warp through which threads the weft of the influences of modern technology and accelerating change to form the rich and complex fabric of a modern society.

Iraq, the land of the twin rivers, mountains and deserts has been the setting for some of the greatest cultures in the history of mankind.

The Sumerian, Assyrian and Babylonian cultures evolved over a period of 4000 years. The remains of their cities and works of architecture, especially the ziggurats and Hanging Gardens of Babylon still evoke the admiration and wonder of present generations.

The birth of the Prophet Mohammed in Mecca in AD570 was an event that signaled a transformation of the world. Arab legions spread the faith of Islam after the death of the prophet Mohammed, east to the Maghreb and Andulusia and west to the borders of India, within the space of one hundred years.

An enormous variety of peoples, cultures and environments were united by Islam. The concept of Unity through diversity, so central to Islam, created a synthesis of society, culture and architecture that enabled strongly diverse cultures from North Africa to India to be regarded as Islamic. Islam is the underlying principle of all Muslim societies and built forms as expressed through each society's architecture strongly reflect this principle. Thus, architecture in the Islamic world and throughout its history, whilst displaying great diversity of style, materials and form, clearly exhibits an essential Unity synthesised by the spirit of Islam.
The Abbasid Caliphate was established in Iraq in 750 and lasted until 1258. The second caliph Abu Ja'far Abdullah Al Mansur, founded the first great city of Baghdad on the banks of the Tigris, the famous circular city of Al-Mansour. Here the power of the Abbasid Caliphs was centralized controlling an area from Tunisia in the East to Central Asia in the West.

During the reign of his successors Baghdad continued to prosper, admirably sited in the centre of this far-flung empire. The most celebrated ruler was the fifth Caliph Harun Al Rashid 786–809. This was the golden age of Baghdad – the city of 1001 nights. Baghdad was a city of domes, minarets, towering walls and arched gates; shrines and Khans; hamams; schools which are the nucleii of the present day Universities and palaces which once resounded to the sound of tambourines, flutes and harps. It was a commercial centre where merchants could be found from China to East Africa. Travellers came from all over the known world in search of education or fortune or to witness the Caliph Al Muktafar and his parading force of 160,000 horsemen and footmen, 7000 slaves, 700 chamberlains and 100 lions. Baghdad was a city whose arts, crafts and culture spread East and West.

The enormous development that Baghdad as a city has experienced in recent years has raised many questions in relation to the changing urban environment, an evolving society, and the influx of modern technology as a result of growth and change. The challenge that these influences present to the development of the Iraqi nation and the growth of Baghdad are paramount.
One of the major challenges is how to go forward to the future whilst respecting the past, how to be true to our heritage whilst building for tomorrow.

Environmentally this is the major concern for planners and architects.

It is in this light that we should consider the design of a State Mosque for Iraq in Baghdad.
CHAPTER 2
BAGHDAD
THE URBAN AND ENVIRONMENTAL PERSPECTIVE
The crossing of the Tigris in central Iraq at the point where that river is most closely approached by the Euphrates, was for millennia the critical centre of Middle East communications, focussing together overland routes which link Asia Minor and the Mediterranean with Central Asia and India.

The name of Baghdad itself is attested in various forms as early as the 2nd Millennium B.C. A plausible etymology of the name is (Baga-data-'given by God') and may be a Babylonian name re-interpreted and persisting in later times.

The second Abbasid Caliph Abu Ja’far Abdallah Al-Mansur made an extensive search for a site for a new capital. He finally chose Baghdad, then a modest village, for the new foundation, and began work on building the new city in 145/762.

The new city, on the West bank of the Tigris, was planned with a circular outline 2638 metres in diameter according to a recent estimate, with an outer ditch, and a double line of walls. In the centre was the palace of the Caliph, and adjoining it to the north-east the cathedral mosque. The mosque occupied the heart of the round city with everything else revolving around it. The mosque was in reality and symbolically the centre of the religious, social and cultural aspects of daily life.

The four gates were those of Damascus, Al-Kufa, Al-Basra and Khusran. Between the perimeters were arched corridors, used at first to accommodate bazaars. Later, as pressure on space within the Round City grew, the whole commercial area was moved outside the gate of Al-Kufa into the fashionable quarter of Karkh (close to the site of our project) which extended nearly three miles southward of the city walls.

After the Caliphs abandoned Samarra in 892 AD a new walled city was built on the east bank of the Tigris.
The State Mosque is viewed as a focal point - a centre focusing religious, social and cultural aspects of life ensuring a dignity and status to the rapid urban development taking place on the west bank of the Tigris. It will provide a notable landmark in the new city scale.

It is one's total approach to the urban environment that has influenced the concept of our design proposal. The purpose of the design is to create an environment for continuous use and not a single monument standing in a vast open space. As such the State Mosque complex is viewed as a continuously growing process - a centre to attract people, a focal point for worship, a centre for study, for social activity, for festivals and fêtes.

This aspect will also generate the potential for an aesthetic renaissance that will see Baghdad as a centre of Islamic art from all over the world expressing both the heritage of Islamic art and the aesthetic consciousness of new generations.

Thus a State Mosque should reflect the essence of Islam, the national aspirations of the people of Iraq, the environmental consciousness of an expanding society and the aesthetic awareness of the Iraqi people whose great historical and cultural traditions provide a direction and impetus for the future to build a revitalised Baghdad once again a centre of the Islamic world.
The site is located alongside Al Rabia street, an existing dual carriageway linking the Khadamiyah area to the north with the airport road to the south.

An existing public park lies to the north of the site while its south boundary is bordered by an ancient canal.

Existing low density residential development (2 storey houses) flank the western boundary, while across Al Rabia street a railway line acts as a buffer to an industrial area.

The site itself is at present a nursery under the control of the Amanat al Asima bordered by mature groves of eucalyptus trees, enclosing citrus and other fruit orchards, pine trees and glass houses for rearing nursery plants.
The planning development for the year 2000 conceives of low density housing flanking the eastern and western boundaries of the site.

The canal to the south is to be revitalised as an urban green belt meandering through the western development of Baghdad to link up with the Tigris.

To the north the existing public park is to be retained.
In line with our conception of a State Mosque as a centre for the new urban expansion to the west of Baghdad we would propose to create a denser multi-use development in the vicinity of the mosque complex. This development could include hotels, offices, bordered by light industry.

The location of the municipal and civic amenity buildings would reinforce the nature of the complex as an area of local government and administration. The immediate borders of the site could be flanked by 4-6 storey residential development to add a denser urban scale to the site.

In line with the revitalization of the canal zone the area to the south could be developed as a public park linked by pedestrian routes and a canal bridge to the mosque.

The existing public park to the north would be developed as an avenue of approach to the mosque, and a setting for fairs and fetes celebrating the great festivals of the Islamic year such as the two feasts of Eid.
CHAPTER 3
THE PHILOSOPHY OF A DESIGN APPROACH
A fundamental tenet of Islam is the principle of Unity manifested in diversity.

This determines the Islamic view of art and consequentially architecture. Underlying all the profusion of detail and form is the generating principle of Unity. Behind the complex manifestation of creation there is the underlying Unity of God, and it is the function of Islamic art to interpret this to man.

Islamic society is seen as a process of continuous development based on principles revealed in the Koran. The architecture of an Islamic society should also reflect this process of continuity. Built forms are the conscious expression of the subconscious aspirations of a society.

An approach to designing a State Mosque should reflect these fundamental principles. The great heritage of Islamic architecture in Iraq and the Islamic world should be seen as the powerful current that generates the inspiration for today's buildings.

Inspiration does not mean slavishly copying the architecture of yesterday but rather understanding its aspirations and how truthfully they reflect the Islamic and Arab way of life.

Society today is affected by rapid change in all aspects of life. In architecture modern technology, new building methods and materials have wrought great changes on the face of city and urban life all over the world.

The challenge the architect and planner faces in the Middle East today is how to use technology to its best advantage – as a tool – subservient to the overall aspirations of a society’s way of life. Architecture should be environmentally sympathetic, both in scale and form, reflect the status of an Islamic society in the modern world and at the same time be seen as part of the overall evolution of Islamic architecture.

It is how to interpret this in the architecture of today that presents the challenge. The architects of the great Abbasid buildings in Baghdad interpreted building forms with materials and technology relevant to their era.

The modern architect, sensitive to all these criteria can partake in the creative joy of interpreting these qualities with new materials and forms of construction.

A State Mosque must reflect the dignity of Islam and the status of Iraq as a modern nation.

Islamic architecture developed and utilized a vocabulary of spatial elements from the very large in scale (the dome, minaret, thick wall, arch) to the very small (the niche, the Mukarnass, arabesque geometry, built-in-seating, decoration). These elements arose from a given historical, cultural and technological context. In time they acquired an independent architectural significance related uniquely to the Islamic faith and culture. This we have tried to emphasize, preserve, and enhance in all aspects of our design.

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The spatial qualities of these elements arose from a given type of technique and craftsmanship which is no longer with us. The arch like the thick wall, was then load bearing and a structural member uniquely suited to the task of carrying the roof or the dome.

Modern technology frees us from the necessity of carrying load with a thick wall or through an arch. The problem for Islamic and modern architecture thus becomes: How can we preserve and enhance upon the particular spatial qualities arising from traditional Islamic architectural forms - related as these still are to a living spiritual, social and cultural tradition - through their deliberate and intentional insertion into a modern technology of building construction? We would not be true to the spirit and essence of great Islamic architecture if we did not pose the problem in this way.

Our approach to a solution can be expressed by the following ideas which are developed in the design.

(i) The linear walled enclosure gives way to the volumetric wall bay unit. The thick wall becomes a "U" shape adding to the depth, thereby regenerating the traditional niche in a new way, and recreating a quality of space and light, which is fundamentally Islamic.

(ii) The structural function is freed from the space-generating function and each maintains an independent and articulated expression.

The traditional load bearing arch becomes a free standing precast element, which introduces a new architectural quality. From being a means to an end, the arch has become an end in itself.

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The traditional load bearing arch becomes a free standing precast element, which introduces a new architectural quality. From being a means to an end, the arch has become an end in itself.

The parapet which used to be a crenellated ending of the very fabric of the wall, becomes instead another assembly of precast units.

(iii) The relationships of structural elements to space-generating elements, like the freestanding arch and the wall bay unit are used to establish a common modular geometry which allows every detail whether structural, spatial or decorative, to follow a logic inherent to the whole design at every scale.

(iv) The variety of building elements, thus assembled are used as vehicles for the exploration and study of proportion, depth and rhythm, in plan, section and elevation.

(v) Building elements are enhanced by a carefully selected application of texture and colour, to the varying planes and volumetric surfaces, in the form of Arabesque geometry and precast calligraphic panels.

This approach to a solution can be expressed by the following ideas which are developed in the design.

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(v) Building elements are enhanced by a carefully selected application of texture and colour, to the varying planes and volumetric surfaces, in the form of Arabesque geometry and precast calligraphic panels.
These patterns and calligraphic panels are not applied to cover up the building elements in any sense. They are integral additions which are used to highlight or understate the spatial qualities of the various parts in their relation to each other. They therefore integrate with the design as constituent elements derived from the same overall modular logic, but at the scale of finishes.

(vi) The process of design continues into the details. Joints indicative of the assembly process are at times expressed and at others hidden. The same pieces of stone are assembled, say on different wall bay units in varying bond patterns, creating a new rhythm between what would have been identical bay units.

It is this manner that we have approached the design of the State Mosque and this is further explored in detail by a conceptual analysis of the elements of the complex.

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CHAPTER 4
SPACE CONCEPT: DESIGN ANALYSIS
TRAFFIC ANALYSIS
CHAPTER 5
ELEMENTS OF A STATE MOSQUE
A CONCEPTUAL ANALYSIS
The Islamic concept of Unity expresses itself as an abstract idea.

Every artistic creation in Islamic art must be treated according to the laws of its own domain of existence and it is the function of art to make those laws intelligible.

Architecture for example should manifest that static equilibrium and state of perfection of motionless bodies as typified in the regular shape of a crystal.

This underlies the regular and abstract nature of an ordered universe as created by God, whose manifested works are ordered by the abstract concept of geometry which can be apprehended by man and applied to his own creations.
The traditional building material in the Baghdad region of Iraq has been brick forged from the red soil of the alluvial plain of the Tigris.

The great architects of the Abbasid period built with materials and technology relevant to their time. The question one asks oneself today is what would have been the response of these architects with the technology modern designers have at their disposal.

A building complex of such magnitude demands the ultimate in technological skills.

Maximum use has been made of precast elements for riwaqs, beams and finishing panels.

It is the intention of the designers to assemble aggregates from all over Iraq for use in reconstructed stone and precast aggregate finish panels to vary in texture, colour and design.

Maximum use will be made at the junction of materials to express the joint to articulate structure, and to use the joints to create their own geometric or arabesque patterns.

Brick size panels will be used in certain areas to give relevant scale, and maximum use of brick and stone will be made on areas of external paving.

Thus through colour, texture and aggregate size from materials assembled from all parts of Iraq the State Mosque will truly be a synthesis of the soil of Iraq.

Material Concept
The massing and proportions of the State Mosque are seen in relation firstly to the skyline of Baghdad.

The massing of the site and prayer hall is seen as a building up of pyramidal masses.

The mosque is shown at the same scale as several buildings of antiquity.

**FORM & MASSING CONCEPT**
22. Who hath appointed the earth a resting-place for you, and the sky a canopy; and causeth water to pour down from the sky, thereby producing fruits as food for you. And do not set up rivals to Allah when ye know (better).
144. We have seen the turning of thy face to heaven (for guidance, O Muhammad). And now verily We shall make thee turn (in prayer) toward a qiblah which is dear to thee. So turn thy face toward the Inviolable Place of Worship, and ye (O Muslims), wheresoever ye may be, turn your faces (when ye pray) toward it. Lo! those who have received the Scripture know that (this Revelation) is the Truth from their Lord. And Allah is not unaware of what they do.
The wall bay unit projecting as an independent element will house panels of calligraphy. It is proposed to set examples of traditional calligraphy at the south (Mihrab facing) end of each wall bay unit. These calligraphic panels will be examples of the calligraphy of different Islamic countries - Egypt, Morocco, Sudan. The north end of each bay will house examples of calligraphy by modern artists of these Islamic countries.

The linear walled enclosure gives way to the volumetric wall bay unit. The thick wall becomes a "U" shape adding to the depth, thereby regenerating the traditional niche in a new way, and recreating a quality of space and light, which is fundamentally Islamic.

The parapet which used to be a crenellated ending of the very fabric of the wall, becomes instead another assembly of precast units.

WALL BAY UNIT

22. He is Allah, than Whom there is no other God, the Knower of the invisible and the visible. He is the Beneficient, the Merciful.

23. He is Allah, than Whom there is no other God, the Sovereign Lord, the Holy One, Peace, the Keeper of Faith, the Guardian, the Majestic, the Compeller, the Superb. Glorified be Allah from all that they ascribe as partners (unto Him)!

24. He is Allah, the Creator, the Shaper out of naught, the Fashioner. His are the most beautiful names. All that is in the heavens and the earth glorifieth Him, and He is the Mighty, the Wise.
Main Entrance

Separate Entrance for ladies

Shaded area denotes ladies' gallery over entry

Elements of screens

Entrance to ladies' gallery from circulation area

LADIES GALLERY
35. Allah is the Light of the heavens and the earth. The similitude of His light is as a niche wherein is a lamp. The lamp is in a glass. The glass is as it were a shining star. (This lamp is) kindled from a blessed tree, an olive neither of the East nor of the West, whose oil would almost glow forth (of itself) though no fire touched it. Light upon light, Allah guideth unto His light whom He will. And Allah speaketh to mankind in allegories, for Allah is Knower of all things.
The boundary wall provides a sense of enclosure to the complex. The scale is monumental.

The changes of direction are articulated by recessed towers and recessed entrance gateways which serve to indicate a "drawing in" or welcome in contrast to the projecting bastions of fortification walls.

The wall is divided into several levels with walkways and arcades providing viewing points for galleries which will house works of Iraqi and other Islamic artists.

**BOUNDARY WALL**
Riwaqs are constructed as a series of precast concrete elements semi-open spaces acting as shading devices, walkways, processional ways, alcoves sheltering ablation areas. They provide a sense of enclosure and scale to the complex.

45. Hast thou not seen how thy Lord hath spread the shade—And if He willed He could have made it still—then We have made the sun its pilot;
The inner Sahān is one prepared place for outdoor prayer, to house 4000 persons.

The outer Sahān is a larger space flanked by Riwaqs which house outdoor ablution fountains.

The principle of Ablutions are as follows:

The Riwaqs house symbolic washing fountains at +6.0 meter level. These are spaced at many points to cope with large crowds during Friday prayer or Eid festivals.

Toilet facilities are located at lower deck levels under the Sahāns at +3.0 meters.

Shoe racks can be left at various points around entrances where shoe kiosks will function as repositories.

Alternatively shoes can be carried and stacked in smaller racks at various points around the pillars of the prayer hall.

6. O ye who believe! When ye rise up for prayer, wash your faces, and your hands up to the elbows, and lightly rub your heads and wash your feet up to the ankles. And if ye are unclean, purify yourselves. And if ye are sick or on a journey, or one of you cometh from the closet, or ye have had contact with women, and ye find not water, then go to clean, high ground and rub your faces and your hands with some of it. Allah would not place a burden on you, but He would purify you and would perfect His grace upon you, that ye may give thanks.
1. Glorified be He Who carried His servant by night from the Inviolable Place of Worship to the Far Distant Place of Worship; the neighbourhood whereof We have blessed, that We might show him of Our tokens! Lo! He, only He, is the Hearer, the Seer.
The Cultural Centre is designed as a formal exterior to harmonize with the dignity of the state mosque complex. The interior is flexible in nature to house the activities requested in the brief and future activities as required during the growth of the complex.
Each cultural pavilion is devoted to the arts and culture of an Islamic country or group of countries.

Permanent exhibitions of panels can be housed in the double volume exhibition spaces, particularly panels illustrating the architecture of traditional Islamic countries.

Temporary exhibitions be displayed on the connecting galleries of craft or art work of Islamic countries.

CULTURAL PAVILIONS
The wall of culture expresses the heritage of the great Iraqi and Islamic civilization with abstract mural panels by Iraqi artists on subjects such as Islamic science, astronomy, mathematics and culture.

The panels could be subject of competitions between Iraqi artists on subjects defined by the Ministry of Awqaf.
Rapid change and modernization have changed the traditional fabric of the old city. In order to avoid urban chaos planners require to understand the nature of Islamic societies in Iraq and to what extent their traditions relate to the Baghdad of the future.

The unity of spiritual and human dimensions of existence is a fundamental tenet of Islam.

Islam expresses itself in everyday life. Social behaviour and human relationships based on the Koran have provided ethical and social values which form the social framework for planners dealing with the physical environment.

These principles create a scale of reference for an evolving society which becomes deeply and almost unconsciously absorbed into the image that the city presents not only to the outside world but also to its own inhabitants. Here is a planning and design principle that derives in a genuine way from Islamic ideology.
Nothing now remains of the Round City or the wall which bounded the city of Baghdad on the east side which was demolished in the 19th century.

The city of Baghdad continued to expand in this century on both sides of the river, with the eastern side becoming the centre of government buildings, commerce and social life.

In recent years the western side of the river has become the location of major urban development.

Baghdad is today undergoing the most concentrated process of economic and social development in its modern history.

A new renaissance is taking place, socially and culturally. A new Baghdad is rising that inherits the mantle of the civic status of Babylon, the dignity of the city of al-Mansour and the glory of the golden city that was the Baghdad of Harun al-Rashid.
The synthesis of culture that the state mosque complex expresses presents opportunities for Iraqi artists to take part in the renaissance of Baghdad cultural life.
164. Lo! in the creation of the heavens and the earth, and the difference of night and day, and the ships which run upon the sea with that which is of use to men, and the water which Allah sendeth down from the sky, whereby reviving the earth after its death, and dispersing all kinds of beasts therein, and (in) the ordinance of the winds, and the clouds obedient between heaven and earth: are signs (of Allah's sovereignty) for people who have sense.

11. Lo! those who believe and do good works, theirs will be Gardens underneath which rivers flow. That is the Great Success.
The state mosque is seen as a focus of the Islamic world and hence seeks to synthesize the Islamic approach to gardens all of which have been inspired by the Koran.

The Oasis, Andalusia, and Mughal Gardens represent the great landscaping traditions at the extremes of the Islamic world.

11. Therewith He causeth crops to grow for you, and the olive and the date-palm and grapes and all kinds of fruit. Lo! herein is indeed a portent for people who reflect.

34. And We have placed therein gardens of the date-palm and grapes, and We have caused springs of water to gush forth therein.
CHAPTER 6
THE FUTURE
The evolution of our design revolves around the concept of a State Mosque as a centre, a focal point for the urban expansion to the west of Baghdad.

In this sense a State Mosque will be a multi-functioning centre reflecting at once:

- The essence of Islam.
- The status of a national symbol.
- A focal point for a renaissance of the arts and crafts in Iraq and the Islamic world.
- A centre of public amenities.

This is to be a complex to reflect the status of Baghdad in the year 2000, a complex with the flexibility to absorb and grow with the changing requirements of public and cultural amenities.

The programme requirements for a State Mosque have been fulfilled in the design concept. Additionally we would propose the following amenities that would eventually reflect the status of the mosque as a true centre of the renaissance of Baghdad.

Public facilities such as an orphanage centre, a handicapped institute, courts of justice could be housed in the immediate surroundings of the mosque as important civic institutions.

The public amenities area could be developed as a meeting place where bazaars, teashops, coffee houses, hammams, bookshops could thrive introducing the atmosphere of the souqs which traditionally surrounded great mosques.

The cultural synthesis can evolve generation by generation. The wall bay units of the outer boundary wall and the lower wall bay of the sahan riwaqs are vestibules to house contemporary and traditional Iraqi artworks.

They can be repositories for the art and craftwork of other Islamic nations reviving again the golden era of Baghdad as a world centre of art and culture.

The public park to the north of the site could be developed as a public open space, emphasising an avenue of approach to the main gateway for pedestrians. This open space will be used for fairs and fetes celebrating the great festivals of the Islamic year.

The area to the south of the mosque across the canal would be developed as another public park to provide a monumental setting worthy of the mosque. A bus station can be developed off the main feeder road and pedestrian links made to the mosque across bridges that could span the canal.

In line with the revitalization of the canal into an urban green belt it is proposed to widen the canal to form a lake to the south of the mosque forming a giant reflection pool. Here channels of filtered water will link with the major water axes of the mosque complex.
Pavilions linked by canal walks could be developed to house permanent exhibitions of Abassid boats and historical river transport. These could be developed in harmony with public boating facilities on the canal.

The shelter belt of palm trees which provide a sense of enclosure to the site, shelter orchards and picnic grounds where families may gather on feast days and holidays.

The multi-use nature and functions we have proposed have been carefully zoned so as not to intrude on the serenity and sanctity of the mosque and the Sahans which form the still point – the hub around which revolves the multifarious activities of life.

Here in essence is our concept for a State Mosque complex - respecting the past while looking forward to the future, reflecting the status and dignity of Baghdad and the Iraqi people and acting as a true centre of Islam.

Here form and function reflect the concept of Unity through diversity which is at the core of Islam.

This concept is a unique setting for the Abassid boats and historical river transport, providing a harmonious space with the public boating facilities. The sheltering palm trees create a sense of enclosure, offering orchards and picnic areas for families on special occasions.

The multi-functional nature of the proposed spaces has been carefully zoned to not disrupt the peace and sanctity of the mosque and the Sahans, which represent the central hub of activity.

In essence, this is our concept for a State Mosque complex that respects the past while looking to the future, reflecting the status and dignity of Baghdad and the Iraqi people, functioning as a true centre of Islam.

Here, form and function mirror the unity through diversity that is fundamental to Islam.
CHAPTER 7
STRUCTURAL CONCEPT
The structural engineering design will complement the architectural concept with the use of traditional and well-tried structural systems and materials. However emphasis will be placed, in the use of these materials and methods of design and construction, on using the best of modern technology to create a structure that will be enhanced by time and attain an historic and symbolic status.

The architectural concept of volumetric expression within the main prayer hall leads naturally to the use of reinforced concrete as the basic structural material. This main hall and all other ancillary areas will be constructed as an in-situ reinforced concrete framework, rigid in all three directions. Such a rigid frame system is capable of withstanding environmental forces such as wind and imposed dead and live loads as well as the limited earthquake forces to which the structure may be exposed. Bearing in mind the long design life anticipated for this structure the increased statistical possibility of the magnitude and frequency of these loadings will be taken into account in determining the design factors. Consideration will be given during the preliminary design stage, to the maximum use of pre-fabrication particularly for floors and roofs, in order to gain the greatest benefits from the repetition of members by way of increased speed of construction and quality of finish of exposed concrete members.

Such an important monumental structure must be built to last. Therefore the materials of construction need to be carefully selected from those which have shown stability and durability with time and yet are products of modern manufacturing processes.

Reinforced concrete will be used for the main framing system, e.g. substructures, walls, columns, beams and slabs, for all parts of the complex in addition to its use in the main prayer hall. Consideration will be given in the early stages of development of the design to the use of specially treated reinforcement including galvanised or epoxy coated bars or the use of stainless steel bars in particularly vulnerable members. The concrete will be specified to be made with strong and durable stone aggregates free from friable and deleterious materials. If such special reinforcement is used, particularly in areas additionally protected with stone cladding, reinforced concrete could be expected to have a very long life even though the initial cost would be high.

One of the principal expressions of the architectural philosophy of the State Mosque complex is in the large number of domes expressed as volumes over the entire roof area. The surface of these domes will be clad in reconstructed sculptured stonework to withstand the extremes of Iranian weather. These domes form three groups:-

Firstly, the main dome 93m in diameter.  
Secondly, 20 number subsidiary domes, 24m in diameter.  
Thirdly, 22 number subsidiary domes 9m in diameter.
Domes may be constructed either of stainless steel, aluminium alloy or specially treated steel sections forming spatial reticulated structures. Reinforced concrete may also be used for the construction of domes but has disadvantages, especially for large span domes, which include:

1. The dead weight is very high requiring massive supporting frames. A preliminary calculation shows that the 90m diameter main dome would weigh about 8700 tonnes in reinforced concrete without any finishes whereas the framework in steelwork would weigh about 1000 tonnes and in aluminium alloy about 400 tonnes.

2. Extensive falsework and formworks of complicated geometry is required. For large span domes, the cost of formwork may exceed the cost of the concrete and reinforcing steel.

3. Construction time is significantly extended.

On the other hand, a steel or aluminium framework for domes has the following advantages:

1. They are light but strong and, when properly protected are durable. The strength/weight ratio is many times higher than that of concrete, aluminium alloy offering the highest ratio. Consequently, a much lower weight is transmitted to the supporting structure.

2. The framework is easier to prefabricate in large sections at ground level in workshop conditions.

3. The erection of the framework does not involve extensive and complicated falsework thus cuts the construction time to a minimum. A possible erection procedure for the type of dome construction recommended below for the main dome construction recommended below for the main dome is illustrated in Fig. 2.

There are a number of different forms of metallic framework systems used for domes. Single layer gridwork domes can be grouped into Geodetic, Triodetic and Lamella systems. These domes are more prone to buckling, especially under un-symmetrical loading unless adequate precautions are taken to stiffen the most vulnerable points. Considerable benefits have been gained in larger span and more heavily loaded domes by the use of a number of layers of double layer grid works giving more rigidity but Introducing a larger number of joints and member types increasing the complexity of erection. Further advantages can be gained particularly in simplifying erection and speedy construction by the use of ribbed space truss construction.

The proposed system to be used on the main dome is of the ribbed space truss family and is more fully described below. However, the final choice of material and system for the dome construction will be made with full agreement of the client and the architect during the preliminary design phase. However our current proposals can be summarised as follows:

- Lamella systems. These domes are more prone to buckling, especially under un-symmetrical loading unless adequate precautions are taken to stiffen the most vulnerable points. Considerable benefits have been gained in larger span and more heavily loaded domes by the use of a number of layers of double layer grid works giving more rigidity but Introducing a larger number of joints and member types increasing the complexity of erection. Further advantages can be gained particularly in simplifying erection and speedy construction by the use of ribbed space truss construction.

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Main Dome

The main dome is 95m in diameter and 45m high from the top of the supporting ring beam which is, in turn, 60m above the prayer hall floor level. In selecting an appropriate structural system for this dome, consideration has been given to the architectural finesses, construction technique, loadings, environmental conditions, available construction facilities, services requirements, durability of materials, its future maintenance etc.

It is envisaged that the dome structure would be a framework constructed of either specially protected steel, stainless steel or aluminium, the choice being made during the initial design work after exhaustive evaluation studies have been completed. As shown in Fig. 1 the framework comprises 20 main ribs, a further 20 secondary plane truss ribs. The main ribs are connected together with 10 ring members thus producing a three-dimensional spatial structure.

Further subdivision of the panels on the dome surface is achieved by providing both longitudinal and ring members consisting of rolled sections also providing support for the outer cladding and inside finishes. The proposed structural system is a well-tried and accepted method of dome construction and has been used to construct large domes all over the world. The 95.5m steel dome for the exhibition hall in Bucharest, Rumania, and the 80m aluminium alloy dome over the indoor sports hall in Benghazi, Libya, may be cited as examples.

Subsidiary Domes

Considering the size of the 25m diameter domes and their position, at about 60m above the prayer hall floor, a metallic framework form of construction may also be conveniently used to these domes. However, depending upon the final architectural treatment of the interior face of the dome, a reinforced concrete solution cannot at this stage be ruled out. Whichever eventual solution is chosen, advantage will be taken of the repetitive use of falsework, fabrication, pre-fabrication and erection methods to speed construction and minimise cost.

The 7m diameter domes will almost certainly be constructed of reinforced concrete. Concrete domes of this size may be precast at ground level and subsequently lifted into place but this would be studied during the initial design period.

The proposed structural system comprises 20 main radial ribs and a further 20 secondary plane truss ribs. The main ribs are connected together with 10 ring members thus producing a three-dimensional spatial structure. Further subdivision of the panels on the dome surface is achieved by providing both longitudinal and ring members consisting of rolled sections also providing support for the outer cladding and inside finishes. The proposed structural system is a well-tried and accepted method of dome construction and has been used to construct large domes all over the world. The 95.5m steel dome for the exhibition hall in Bucharest, Rumania, and the 80m aluminium alloy dome over the indoor sports hall in Benghazi, Libya, may be cited as examples.
The construction methods will largely depend upon the resources available to the successful contractor and which will be reflected in the tender. However, assumptions regarding construction techniques must be made by the engineer, at the design stage, to ensure that the design concept allows the use of the most advantageous of these to be reflected in contractors tenders to the client’s financial advantage. We envisage that the tall columns and framing beams of the main prayer hall, being in in-situ concrete, will probably be constructed using climbing floors or slip-formed in groups for maximum speed. The floors of the underground car park and the grand Sahān may be constructed using precast units with in-situ topping. The ring beams for the main domes will be cast in-situ whereas the metal framework of the dome will be prefabricated at the ground level and lifted in place as previously described to give a stable framework for fixing insulation, inside and outside cladding and finishes.

Underground accommodation will be designed to provide a high standard of protection against ground water ingress by the use of two layers of bitumen membrane. For particularly important areas additional protection may be given by incorporating a drained cavity inside the structural retaining wall.

Foundation systems will have to be determined following a site investigation comprising trial pits, deep boreholes, sampling and laboratory testing. However, sufficient is known about the general soil conditions in Baghdad to enable us to anticipate that bored or driven concrete piles will be required for the majority of the foundations. It is likely that all concrete underground will require to be protected against sulphate attack and therefore sulphate resisting cement will be specified and probably additional protection provided by the use of a polythene or bitumen membrane.

For the general roof structure investigations will be made at the preliminary stage to anticipate that bored or driven concrete piles will be required for the majority of the foundations. It is likely that all concrete underground will require to be protected against sulphate attack and therefore sulphate resisting cement will be specified and probably additional protection provided by the use of a polythene or bitumen membrane.

Construction of Main Dome

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CONSTRUCTION
METHOD OF
MAIN DOME
CHAPTER 8
SERVICES CONCEPT
At the inception of a project the environmental engineer is able to offer advice on the thermal properties, fenestration, natural daylight effects and acoustic environment of a building. The natural fabric of the mosque has at the outset determined the thermal properties to a large degree, and the following descriptions attempt to convey the various solutions to the other environmental problems.

Building Fabric

The dimensions of this building will permit the use of a heavyweight construction material which will assist in damping the large temperature extremes experienced daily and between seasons. This natural ability of the fabric will assist in summer to slow down the rate of heat transfer by creating a time lag of approximately 11 hours, but in winter the internal fabric must be selected to maintain the internal air temperature and slow the rate of heat loss through the building elements.

In an attempt to maintain a naturally high internal air temperature during winter, insulation will be positioned in the wall cavity, thus allowing the internal skin of the wall, which will have a high specific heat capacity, to retain as much heat as possible.

Air Conditioning

The selection of an air-conditioning system to provide year round air conditioning to the total volume would undoubtedly require a space allocation for central station air handling plant, electrical supplies, standby generating plant and distribution of mechanical and electrical services, and is considered impractical.

Because of the large volume of the prayer hall, the effective zone of occupancy has been considered necessary to condition is the total floor area to a height of 3 metres. The volume above this should have no significant effect on human thermal comfort providing conditions below 3 metres are maintained within reasonable temperature and humidity limits.

External design conditions should be selected from an analysis of the past 25 year records but from the temperature and humidity charts provided for this project the mean values are 35°C DB and 22% relative humidity, indicating a wet bulb temperature of approximately 20.3°C in summer and 10°C DB and 70% relative humidity indicating a wet bulb temperature at 8.5°C in winter.
From experience of environmental design in Baghdad it is considered that these values will be exceeded and that more practical temperature and humidity values will be in the region of 45°C DB to 50°C DB and relative humidities of 15% to 25% in summer and 0°C DB to 5°C DB and relative humidities of 75% to 85% in winter.

Internal design conditions shall be selected on analysis of human comfort taking into account dry and wet bulb temperature and relative humidity values of the various seasons, also quantity of clothing worn and economic design parameters associated with plant selection.

An initial analysis of the constraints associated with the selection of the internal environment indicates that the temperature and humidity levels selected should be in the region of 25°C DB to 30°C DB and 45% to 55% relative humidity in summer and 12°C DB to 18°C DB and 40% relative humidity in winter.

The fresh air rate per person will be analysed to determine what lower limit may be selected without causing physiological problems. This analysis will allow optimum plant sizing and should highlight possible periods when air may be completely recirculated.

To minimise the air conditioning load it is proposed that the total area of the prayer hall be zoned into regular units which will accommodate between 200 to 500 persons, the constraints on these numbers will be the number of, and space allocation for, air handling plants, and their respective duties.

Zoning the conditioned space is an extremely important analysis and must provide for flexibility and economy of operation. It will also reduce the size and number of air distribution ducts. Air velocities in ducts will be kept to those standards recommended by the Chartered Institution of Building Services of Britain to produce an economic design which will not create disturbing noise.

Initial analysis suggests that the selection of a constant velocity air distribution system at the building perimeter zone and a variable volume zone at internal zones, will be those for which fan pressures will be minimised and there should be no necessity for over elaborate silencing which would be required for high velocity systems. Therefore plant operating costs will be minimised and only called upon to perform their maximum duties during periods of maximum occupation. However, these and other systems require more rigorous analysis before finally deciding on a single or combination of systems to provide ideal air conditioning system. The more detailed analysis would also investigate heat recovery techniques for energy saving.

The position of the air distribution grilles is important if noise, draught and length of air throw are to be optimised. Noise and draught can be overcome by proper attenuation and grille selection but the throw of air will require an in-depth analysis as grilles are to form a design element of the natural fabric of the building.
The selection of a site for the plant room is a major decision is maximum savings are to be made in capital cost of the installation and also in construction time scale. A large proportion of the services cost element will be the quantity of ducting, and as such great emphasis must be placed on siting the plant room as close as possible to the prayer hall whilst maintaining a reasonable distance or fabric construction to minimise structural and air borne noise.

Utilising the area immediately below the prayer hall provides an ideal position and would only be considered acceptable if the most strict design constraints were imposed on the floor structural thickness to prevent noise transmission, the layout of plant and distribution of ducting with respect to noise and vibration control.

Two plant room options exist. The first, to provide one large plant room; the second to provide a plant room below each zone. Both methods have merits, but the former may necessitate long expensive duct runs, and the latter reduce the available space for other facilities such as car parking. It is possible in the final analysis that there will be little difference in cost but the latter method may prove more cost effective with respect to space allocation as deep ducts will not be necessary.

The zoning of the main prayer hall as the criteria for air conditioning its large volume, almost automatically selects the number of air conditioning units, and it would only be considered acceptable if the most strict design constraints were second to provide a plant room below each zone. Both methods have merits, but scale. A large proportion of the services cost element will be the quantity of electric substation hence minimising the connections of Municipality services and are to be made in capital cost of the installation and also in construction time.

To shield the boilers, chillers and cooling towers from view, plant rooms will be designed as architectural features and where possible use will be made of flue dilution to prevent chimneys smoking.

The sitting of the boilers and chillers at the boundary can be combined with an electrical substation hence minimising the confections of Municipality services and removing the noise and vibrating machinery away from the mosque.

Fresh air make up will be drawn in from the side of the mosque, into the plant rooms. Air inlet points will form architectural garden features or be incorporated within a builders work duct below terrace areas.

Exhaust air from air conditioning plants would be discharged below ground and allowed to ventilate other areas such as the lower ground floor parking areas.

The lower ground floor car park will be designed to have clear openings to atmospheres. Zoning of the air conditioning systems will provide air movement within the car park in the ratio to the number of visitors to the mosque.

It is not envisaged that this equipment will be housed in the mosque, but in a convenient position at the boundary wall, to minimise noise problems.

The heating and cooling mediums employed would be low pressure hot water and chilled water, provided by boilers and refrigeration chilling sets coupled to cooling towers. It is possible in the final analysis that there will be little difference in cost but the latter method may prove more cost effective with respect to space allocation as deep ducts will not be necessary.

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The zoning of the main prayer hall as the criteria for air conditioning its large volume, almost automatically selects the number of air conditioning units, and it is to be anticipated that there will be between 80 - 150 central station air conditioning units serving the mosque. These plant numbers are derived by allowing approximately 500m2 to 260m2 per plant or one plant per 250 people.

The heating and cooling mediums employed would be low pressure hot water and chilled water, provided by boilers and refrigeration chilling sets coupled to cooling towers. It is envisaged that this equipment will be housed in the mosque, but in a convenient position at the boundary wall, to minimise noise problems.

To shield the boilers, chillers and cooling towers from view, plant rooms will be designed as architectural features and where possible use will be made of flue dilution to prevent chimneys smoking.

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The lower ground floor car park will be designed to have clear openings to atmospheres. Zoning of the air conditioning systems will provide air movement within the car park in the ratio to the number of visitors to the mosque.
The control of the air conditioning and all other building services will be fully automatic and initiated by a building automation system. This system will be computerised and its software produced by experts who will know the thermal analysis of the building fabric for an ideal annual cycle. The ideal cycle will be updated on an annual basis to provide more accurate data for plant optimisation in operation.

The initial thermal performance of the building fabric will also be analysed by the computer to determine the optimum heating and cooling periods. Temperature, humidity, damper positioning, lighting, fire detection and other important systems will be monitored throughout the complex by the building automation system.
NATURAL VENTILATION

The preceding discussion assumes that air conditioning will be necessary all year round but this will not always be necessary.

The following discussion is being put forward as a method for creating a natural cross flow ventilation system in the mosque and as a method of optimising the starting period of the air conditioning plant, and to achieve an acceptable non air conditioned environment in the mosque. This principle is based upon the Bad-qir - the traditional means of ventilating homes and other structures by means of natural ventilation utilizing air movements and currents controlled by vanes and louvres. With the aid of computer techniques it will be possible to determine the air flow patterns and temperature profile created by opening and closing dampers, positioned at high level in the prayer hall.
At a first approximation sketch No. 1 indicates that the inside air temperature will approximate to 36°C when considering air change rates during the summer period. A more rigorous and detailed approach will be necessary to verify the method and its usefulness. However, notwithstanding these statements, the method is put forward for consideration as a design methodology and as a practical solution to reduce the number of air conditioning plants or their total operating period and also their cooling capacity.

There will be periods when the mosque is only partially occupied and it is during these times when it is hoped to utilise natural ventilation to maintain the indoor temperature to acceptable limits.

The method by which it is anticipated this will be achieved is by sensing the internal air temperature and automatically opening and closing dampers on the windward and leeward sides of the building. These dampers will be positioned at high level and in the horizontal plane in the window sections. See sketch no. 2 as a typical example. It is not considered necessary to provide total perimeter dampers, but the programme for this form of ventilation control will have an override control to open all dampers when necessary thus providing a high level of cross ventilation.

These values indicate the reflective nature of the surfaces and further detailed investigations will be necessary to obtain a more accurate analysis before a decision can be taken as to the form and surface area to be covered by acoustically absorbent materials.

It is to be anticipated that dampers will require acoustic treatment in the form of an acoustic veil behind the internal dome. This internal dome will be constructed for maximum acoustical absorbance.

Acoustic treatment to other elements may take the form of spray on material to the rear acoustic wall panels and carpeting.

To ensure that all people within the hall are able to hear the Linen, a sound re-inforcing system will be necessary. This will take the form of a loud speaking system to areas of concentrated occupants. Speakers will be controlled in steps from a central position.

**LIGHTING**

Lighting of the internal of the prayer hall will require special treatment to create an ambience which will reflect the use of the building. The internal and external lighting will be designed in close collaboration with the architect to achieve this desired effect.
CONDENSATION

A solution to prevent condensation of the principal dome will be to create a pathway through which natural ventilation will be encouraged. To achieve this, the external cladding of the dome will be supported on a lattice framework allowing air to circulate freely.

Initial calculations indicate that condensation will occur on the inside surface of the dome, but this will be eliminated by creating a deep internal skin to the dome. The void between the external and internal domes will be large enough to allow a passageway to the top of the dome. Natural air circulation will again be promoted by allowing air to enter at the base of the internal dome skin and leave at the top of the dome.

Sketch No. 3 indicates a possible method of natural ventilating domes.

ACOUSTICS

The other consideration associated with the domes and many hard surfaces is that of building acoustics.

Preliminary calculations indicate that the reverberation time, which is an indication as to the time taken for the sound energy to decay by 60 dB, is in the range of 45 seconds at 125 Hz to 9 seconds at 2 KHz, with the prayer hall full, to 40 seconds at 125 Hz to 6.3 seconds at 2 KHz with 10,000 people in the prayer hall. Reverberation time for speech should be in the region of 1.5 to 2.0 seconds.

These values indicate the reflective nature of the surfaces and further detailed investigation will be necessary to obtain a true spectral analysis before a decision can be taken as to the form and surface area to be covered by acoustically absorbent material.

It is to be anticipated that domes will require acoustic treatment in the form of an acoustic mat behind the internal dome. This internal dome will be perforated for maximum acoustic absorption.

Acoustic treatment to other elements may take the form of spray on material to the roof, acoustic wall panels and carpets.

To ensure that all persons within the hall are able to hear the Imam, a sound reinforcing system will be necessary. This will take the form of a hard wired system to a series of concealed speakers. Speakers will be controlled in zones from a central console.

LIGHTING

Lighting the inside of the prayer hall will require special treatment to create an ambiance which will reflect the use of the building. The internal and external lighting will be designed in close collaboration with the architect to achieve this desired effect.

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LIGHTING

Lighting the inside of the prayer hall will require special treatment to create an ambiance which will reflect the use of the building. The internal and external lighting will be designed in close collaboration with the architect to achieve this desired effect.
SKETCH LIST

SKETCH NO. 1  TEMPERATURE/AIR CHANGE RATE RELATIONSHIP

SKETCH NO. 2  NATURAL VENTILATION PROPOSALS, MAIN PRAYER HALL

SKETCH NO. 3  NATURAL VENTILATION PROPOSALS, DOME

الرسوم التوضيحية

١- درجة الحرارة و مقابلتها ب معدل تبادل الهواء
٢- التهوية الطبيعية المقترحة ل ساحة المصلات الرئيسية
٣- التهوية الطبيعية المقترحة للقبـة
Natural Ventilation Proposals for Main Prayer Hall

Natural Ventilation Proposals for Main Dome
Internal lighting will be divided into two categories, atmospheric and special effects lighting.

Atmospheric lighting will be designed to maintain an even plane of light throughout the overall floor area. To achieve this zonal lighting techniques will be utilised using mainly low brightness tungsten lamps. The design of lamp clusters will be an architectural feature.

Special lighting will assist in revealing the magnitude of the prayer hall and its many domes. An array of spot lights and high pressure lamps will be selected according to their colour spectrum as those which will display to maximum effect according to their colour spectrum as those which will display to maximum effects.

Atmospheric lighting will be designed to maintain an even plane of light for water discharge.

Plant room with all vibrating and rotating equipment isolated from the building structure.

Other services will include general and special effect lighting, security, fire alarm and fire prevention systems and all modern water and sanitation facilities.

The building will be fully serviced which will include air conditioning, specifically acoustically treated to create acceptable noise levels in a building of this nature. Other services will include general and special effect lighting, security, fire alarm and fire prevention systems and all modern water and sanitation facilities.

To create acceptable noise levels the air conditioning will be an air low velocity system supplied from central station air conditioning units in a basement plant room with all vibrating and rotating equipment isolated from the building structure.

DRAINAGE

Surface water will be collected from the roof of the hall and surrounding patios, into a series of drains and discharged to the sewers positioned beyond the site boundary. Foul drains from toilets will also discharge beyond the site boundary in a combined surface water and foul drain system. Water discharging from surrounding grassed areas and internal roads and paths will utilise the same system for water discharge.

CENTRAL LIBRARY

The services to this building will require special environmental consideration, if the many books and manuscripts are to be maintained in good order.

The building will be fully serviced which will include air conditioning, specially acoustically treated to create acceptable noise levels in a building of this nature. Other services will include general and special effect lighting, security, fire alarm and fire prevention systems and all modern water and sanitation facilities.

To create acceptable noise levels the air conditioning will be an all air low velocity system supplied from central station air conditioning units in a basement plant room with all vibrating and rotating equipment isolated from the building structure.
Detailed acoustic analysis of the air distribution system will be required to ensure proper sound levels are achieved in the various rooms of the building.

Lighting will be a predominant feature of this building and special consideration will be given to the selection of light sources in the provision of correct lighting levels to create a pleasing atmosphere.

An additional facility considered necessary to maintain records is computer system.

This facility will be used to catalogue all books and manuscripts not only in this library, but also information on other important Arab books and manuscripts throughout the world.

The library indexing system could be computerised with records to books being retrieved at visual display units positioned at a control point within the library.

The computer system could also be used to record books on loan and overdue notices raised automatically at the end of a set time period.

EDUCATIONAL FACILITIES

For the educational facilities associated with the library as would recommend a variable air volume air conditioning system which will automatically vary the supply air volume to the various classrooms and study areas, as a method of obtaining maximum operating efficiencies.

Transmission of sound and vibration will be analysed to provide maximum attenuation of structure, air and duct borne noise and vibration.

Lighting will be designed to create a pleasing and invigorating atmosphere in which to work whilst levels of lighting will be created to minimise visual fatigue.

MEETING ROOMS

These large meeting rooms housing 200, 300 and 800 people will be fully air conditioned with design parameters which consider noise from plant as a major problem.

Detailed consideration will be given to sound spectral analysis of air conditioning systems, also air distribution patterns and lighting designs and quality of installation if it is considered necessary to divide rooms in order to provide totally separate accommodation for various meetings.
For these large spaces low velocity air distribution will be necessary to prevent air noise being transmitted through the ducts, with the central station air conditioning units being zoned to allow sub division of meeting room space allocation, and standby facilities in the event of a power failure.

Lighting in these areas will be a combination of soft and pleasing yet include the facility to highlight a stage area.

An alternative function of these rooms may be as exhibition or conference facilities including multi-purpose stage accommodate speech, drama, music or to screen major films. If conference facilities are considered necessary then we will be necessary to screen major films.

This kitchen should be designed to allow for the preparation of meats, fish, pasty and fresh vegetables in their respective areas with daily storage facilities adjacent. Central cold storage units should be positioned for ease of transport access.

A careful study of food flow from kitchen to dining room will be necessary to ensure that food is received at the tables in a hot state as well as ensuring free flow of waiter service.
RESIDENTIAL ACCOMMODATION

Services to these units will be similar to high class hotel accommodation, with the air conditioning being provided by individual ceiling mounted fan coil units.

Where possible these units will be used to serve two rooms used for the same purpose, in one house. Units will be designed to be super-silent and have rigorous acoustic treatment, and they shall be selected for their ease of operation, maintenance, capability and quietness.

Lighting will be special to create a pleasant atmosphere and be designed to reflect the traditional features.

Other services will include small power, sanitation and water services, all concealed from view but designed for ease of access and maintenance.

ARCADE

It is not intended to provide air conditioning to this area, but that its architectural design should promote natural air circulation through its passageways. To assist in the humidification process the pools and fountains will transfer moisture to the air moving over their surfaces.

The shopping facilities within the arcade will have a facility to include air conditioning at the owners request and to prevent unsightly condensing units mounted at roof level. Chilled water and hot water will be piped to each unit. In order to monitor water and power consumption to shop, individual metering units will record water quantity and power consumed. It is to be expected that shop owners will fit out and decorate their own units whilst keeping within minimum standards of design.

CAR PARK

A large majority of cars will be parked in a lower ground floor car park.

This area will require complete sprinkler protection and ventilation provided by the exhaust air from the mosque air conditioning systems possibly being supplemented by additional fresh and exhaust air fans.

Lighting to the car park will be to a level adequate for its purpose and all light fittings will be selected for use in car parks and be surface mounted, as will conduit containing the electrical wiring. Control of lights will be built into the building automation system.
EXTERNAL SERVICES

LIGHTING
The feature of this lighting will be to highlight the attractions of the gardens and fountains and to create a low level of illumination on the many paths throughout the gardens.

ABLUTION FACILITIES
Careful consideration of traffic flow within the site boundary will be necessary to finally decide positions and number of units.

WATER AND POWER DISTRIBUTION
These services will be run in underground trenches, and be sited in positions which will permit access for maintenance and create a minimum disruption to the external activities.

The various services will be segregated into compartments thus keeping water, electricity and gas separate. Gas ducts will be continually monitored for gas leaks and vented mechanically or to atmosphere as often as possible to prevent the accumulation of explosive vapours.

ENERGY CENTRE
This will be used to house the large reciprocating machinery, cooling towers, boilers and electrical transformers.

It is more than possible that its size will require the plant to be housed in one or more units to facilitate its seclusion.

The positions considered are at the boundaries of the site, with the water and electrical services radiating from these units to the various buildings.

Our solution to minimise the above problems is to maintain the transformers and generators in the energy centre.
**DIVERSIFICATION OF SERVICES**

In assessing the electrical power, chilled water and hot water requirements the period and frequency of operation will be analysed in great detail in order to deduce the minimum chillers, cooling towers and electricity consumed.

To maintain services during periods of mains power failure, load shedding between buildings will be assessed in order to provide a minimum of emergency escape lighting and possibly reduced air conditioning in, for example, the large meeting halls. If these were not in use then this power could be transferred to the arcade, library or the educational facilities to provide additional lighting, and cooling or heating. The total extent to which power and water can be transferred from building to building at a time of mains power failure will be the subject of an in depth analysis.
CHAPTER 9
OUTLINE SPECIFICATION
OUTLINE SPECIFICATION

Substructure And Basement

The substructure and basement will be subject to full design consideration. It is anticipated that the foundation will be supported on piles. The ground bearing slab and retaining walls will be of insitu reinforced concrete with asphalt or similar tanking.

Structure

The structure will be of reinforced insitu concrete of the highest standards for durability appearance and strength. The complex contains many different concrete technology sensitively tested in detail of shattering and jointing as the medieval masters and builders used.

The architectural concept envisages a concrete external surface to the main walls and domes. This would be achieved by using precast panels formed to the required curvature. A high quality finish is achieved by these and other concrete surfaces is required.

The achieving of a high quality exposed concrete surface which will approach the quality of a natural stone finish is virtually impossible to obtain when using insitu construction. Extremely high quality surface finishes can however be obtained using pre-casting methods particularly where there is a high level of repetition.

For many years precast panels fixed to the face of buildings with anchors have been used and this would lend itself to facing this main dome.

More recently precast concrete units have been used as permanent formwork to provide high quality facing to an insitu concrete member. This form of construction has been developed very successfully. The method lends itself to the expression of the building form in many types of surface finish giving the architect virtually complete freedom to make his own choice of surface texture whilst maintaining high factory construction standards and reducing the constraints which would otherwise be imposed by trying to achieve high quality finishes on site.

Other advantages are that it can reduce the extent of falsework required, minimise the use of expensive materials including white or coloured elements and expensive special aggregates and furthermore can be extended to the incorporation of moulded surfaces without having to resort to expensive handcarving of natural stones.

Precast units will interact with the basic structure forming frieze panels, castellations, arches and domes.

The location of all carvings and friezes on the precast panels will be specified and will be based on large size design details provided by the consultant team and intended to reduce the burden on the contractor and reduce the overall cost of the building.

THE HECKEL Systems

The Heckel Systems will ensure the use of expensive materials including white or coloured elements and expensive special aggregates and furthermore can be extended to the incorporation of moulded surfaces without having to resort to expensive handcarving of natural stones.

The architectural concept envisages a concrete external surface to the main walls and domes. This would be achieved by using precast panels formed to the required curvature. A high quality finish to these and other concrete surfaces is required.

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The location of all carvings and friezes on the precast panels will be specified and will be based on large size design details provided by the consultant team and intended to reduce the burden on the contractor and reduce the overall cost of the building.
In selected places in the interior a natural marble finish would be specified.

The wall bay decorations some of which are indicated in this report would all be derived with reference to the particular character of Islamic heritage in Baghdad.

It is envisaged that the exterior finish will be of an alabaster coloured reinforced concrete with a slight textured and worked relief on certain surfaces.

It is recommended that in a few selected and highly strategic locations in the prayer hall and the main entrance gate, an enriched artwork finish is employed. Such finishes distinguish these buildings by reflecting in them the cultural and great artistic heritage of Islamic civilization in detail design.

These finishes are worked finishes. They are essentially areas of artwork and three dimensional relief or highly enriched craftwork which are designed into the very fabric of the building and implemented in the latter stages of the construction programme.

Iraqi artists and specialist craftsmen should be commissioned to produce work for the many areas suitable for treatment. In certain areas craftwork from throughout the Islamic world can be displayed.

These would include work in stone and marble, hardwoods, metals, plaster, ceramics and glass.
CHAPTER 10
ANALYSIS OF AREAS
## SCHEDULE OF ACCOMMODATIONS

<table>
<thead>
<tr>
<th>Space</th>
<th>Area m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mosque</td>
<td>42,000</td>
</tr>
<tr>
<td>2. Ladies gallery</td>
<td>2,800</td>
</tr>
<tr>
<td>3. Daily prayer area</td>
<td>900</td>
</tr>
<tr>
<td>4. Open air prayer area:</td>
<td></td>
</tr>
<tr>
<td>outer Sahan</td>
<td>13,900</td>
</tr>
<tr>
<td>inner Sahan</td>
<td>5,000</td>
</tr>
<tr>
<td>5. Library</td>
<td>7,000</td>
</tr>
<tr>
<td>6. Accommodation for 10 visiting Imams</td>
<td>500</td>
</tr>
<tr>
<td>7. Accommodation for 40 family units</td>
<td>6,000</td>
</tr>
<tr>
<td>8. Meeting room for 300 people</td>
<td>500</td>
</tr>
<tr>
<td>9. Meeting room for 800 people</td>
<td>1,400</td>
</tr>
<tr>
<td>10. Teaching institute of 10 classrooms</td>
<td>1,600</td>
</tr>
<tr>
<td>11. Institute of 6 classrooms</td>
<td>720</td>
</tr>
<tr>
<td>12. Dining for 500 people</td>
<td>1,200</td>
</tr>
<tr>
<td>13. An arcade for selling books and artifacts</td>
<td>250</td>
</tr>
<tr>
<td>14. Covered car park</td>
<td>30,800</td>
</tr>
</tbody>
</table>
 CHAPTER 11
COST ANALYSIS

### PHASE I

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost (IDK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main mosque</td>
<td>97,000,000</td>
</tr>
<tr>
<td>Minaret</td>
<td>7,700,000</td>
</tr>
<tr>
<td>Cultural centre</td>
<td>21,550,000</td>
</tr>
</tbody>
</table>

### PHASE II

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost (IDK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giant awning</td>
<td>9,400,000</td>
</tr>
<tr>
<td>With car parking and plant rooms</td>
<td>100,000</td>
</tr>
<tr>
<td>Daily prayer area</td>
<td>300,000</td>
</tr>
<tr>
<td>Rainwater and effluents</td>
<td>9,560,000</td>
</tr>
<tr>
<td>Boundary wall</td>
<td>5,500,000</td>
</tr>
<tr>
<td>Main entrance</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Side entrance</td>
<td>2,000,000</td>
</tr>
<tr>
<td>&quot;Jerusalem&quot; pavilion</td>
<td>800,000</td>
</tr>
<tr>
<td>Cultural pavilion (4 no.)</td>
<td>4,410,000</td>
</tr>
<tr>
<td>Hygiene</td>
<td>350,000</td>
</tr>
</tbody>
</table>

### External works

- including hardscape and soft landscaping, water, sanitation, painting walls, door, car parking, landscaping, and external services: 18,800,000

**TOTAL: ID 111,200,000**

The above is based on current rates without any allowance for future inflation.

A total of ID 8,350,000 is included for furniture and furnishings.

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الفصل 11
حلاقة الخلافة

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[Citation or reference to Arabic content]

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[Additional content in Arabic]
A scheme of this magnitude and importance is conceived by the consultants as a work that, will be constructed and developed as a continuous process during which the buildings could be further developed and enriched with the addition of works by Iraqi artists and specialist craftsmen, from all over the Islamic world.

While the whole development, if let as one or as a series of concurrent contracts, could take up to 5 years to construct it is envisaged that a scheme of such importance and grandeur should be considered as lending itself more to a phased development.

The first phase would be the mosque, with the daily prayer area, together with the minaret and part of the cultural centre, with associated areas of Riwaq, pavings, car parking etc., and this, could be accommodated within or close to the budget of ID 110 million.

<table>
<thead>
<tr>
<th>PHASE I</th>
<th>Main mosque</th>
<th>89,900,000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minaret</td>
<td>7,700,000</td>
</tr>
<tr>
<td></td>
<td>Cultural centre</td>
<td>21,550,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PHASE II</th>
<th>Grand sahan</th>
<th>9,600,000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily prayer area</td>
<td>800,000</td>
</tr>
<tr>
<td></td>
<td>Riwaq and colonnades</td>
<td>9,900,000</td>
</tr>
<tr>
<td></td>
<td>Boundary wall</td>
<td>5,600,000</td>
</tr>
<tr>
<td></td>
<td>Main entrance</td>
<td>1,000,000</td>
</tr>
<tr>
<td></td>
<td>Side entrance</td>
<td>2,000,000</td>
</tr>
<tr>
<td></td>
<td>&quot;Jerusalem&quot; pavilion</td>
<td>600,000</td>
</tr>
<tr>
<td></td>
<td>Cultural pavilions (4 no.)</td>
<td>4,150,000</td>
</tr>
<tr>
<td></td>
<td>Housing</td>
<td>350,000</td>
</tr>
<tr>
<td></td>
<td>External works including hard and soft landscaping, water gardens, palm groves, open car parking, drainage and external services</td>
<td>18,000,000</td>
</tr>
</tbody>
</table>

| TOTAL | 171,200,000 |

The above is based on current rates without any allowance for future inflation.

A total of ID 8,650,000 is included for furniture and furnishings.
CHAPTER 12
DESIGN PROGRAMME
STAGES OF WORK

The following stages of implementation of the design are proposed:

Stage I: Preliminary Design

This stage would comprise a comprehensive statement of the design concept. The submission would consist of:

- Site plan 1:1000.
- Comprehensive set of design drawings including all plans, elevations and sections at 1:200 scale.
- Selected details of whole bays of the building at 1:50 scale.
- Landscape details of selected areas at 1:200.
- Design Report including outline of structural concept, services design, special finishes and updated cost estimate.

Stage II: Final Design

This stage would incorporate all amendments and comments raised by the client after detailed discussions and analysis of the preliminary scheme. The submission would consist of:

- Site plan.
- Design drawings: Plans, sections, elevations at 1:200 scale.
- Typical elevational bays at 1:50.
- Outline structural concept drawings.
- Outline services schematic drawings.
- Landscape master plan.
- Landscape details.
- Design report including the structural concept, services design, special finishes report and a detailed cost estimate.

Stage III: Working Drawings

A fully comprehensive set of architectural, structural and services working designs will be submitted for approval at the end of the stage. Included in the submission will be a set of special finishes detail drawings for implementation.

Stage IV: Tender Documentation

This stage will include the specification documents, Bills of Quantities and priced Bills of Quantities with Final Design.

Stage V: Supervision

This stage will include full site supervision during the construction period.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Preliminary Design</td>
<td>60 days</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Final Design</td>
<td>75 days</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Working Drawings</td>
<td>220 days</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Tender Documentation</td>
<td>45 days</td>
</tr>
</tbody>
</table>

The consultants recommend an additional 60 day period within which to formulate an exact brief with the client and to present a design inception report. During this period further research, team mobilisation, and necessary surveys would be carried out.

The programme of work:

- Stage 1: Preliminary Design - 60 days
- Stage 2: Final Design - 75 days
- Stage 3: Working Drawings - 220 days
- Stage 4: Tender Documentation - 45 days

This programme of work includes:

- Preliminary Design
- Final Design
- Working Drawings
- Tender Documentation

The consultants recommend an additional 60 day period within which to formulate an exact brief with the client and to present a design inception report.
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12. The Book of the Prophet Muhammad, translated by Abdullah bin 'Abbas, 1912.
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