1989 Technical Review Summary
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Darul Aman Mosque

Gelang Town, Singapore

Architect
Housing & Development Board (H.D.B.)
Mohd. Asaduz Zaman
Singapore

Client
Majlis Ugama Islam Singapura
Singapore

Table of Contents

I. Introduction

This Mosque is located in a dense urban sector of Singapore which was redeveloped in the period 1975-80. Using modern technology to achieve a traditional profile, this mosque is the most architecturally significant of the "New Generation of Mosques" in Singapore constructed and designed by the Government for the Muslim population of Singapore (about 350'000 people, i.e., 15% of the population). The Darul Aman Mosque is one of the 80 mosques in this metropolis. Functionally and aesthetically, this building is highly successful because its design successfully meets the needs of the muslim users and it is also a symbol of unity for the community that uses it.

II. Context

a. Historical Background

Singapore is a small, densely built up island just over 600 sq km in area. The mainland of Malaysia, the large Indonesian islands of Sumatra, Java and Kalimantan (Borneo) surround it and have a major influence on its economy and culture. Being almost totally urbanised, the natural resource hinterland of Singapore lies in Malaysia and Indonesia.

Between 1819 when the East India Company acquired this island with barely a thousand inhabitants, and today with over 2.5 million inhabitants, Singapore has become one of the most sophisticated *entrepots* in the east. The population, though multi-racial, is dominated by a Chinese component of over 78% with Malays and Indians. Singapore is a highly industrialised and prosperous island where the *per capita* annual GNP in over the US$ 5'000 mark. The Arabs introduced Islam to all these islands sometime between the thirteenth and fourteenth centuries predominantly amongst the Malay population, although Indians and Indonesian muslims are also included in the muslim community. Historically, amongst the muslim community, it was the dominant Malay population which was least prosperous. The Indian, Indonesian and Arab Muslims had arrived as traders and settled as such in Singapore and were always relatively prosperous. The Malays, on the other hand, were poorly educated agriculturists and fishermen and had remained as the poorest part of the Singapore community for a long time. It is interesting to read the perceptions that the Muslims have of their own community in Singapore:

"Among the key problems facing the Malay/Muslim community here, is their low socio-economic status. Although the literacy rate among our community is high, that is 86.5% the number of the highly educated in our midst is very small, thus leaving the community, as a whole, unable to find good jobs. Further, the proportions of Malay/Muslim skilled workers in the professional, administrative, technical and managerial fields remains low - only about 2.4%, and the number of Malay big time enterpreneurs in our society is few and far between. In addition there is also the problem of the spiritually weak and unstable amongst our younger generation. As a result, those youngsters are subject to deviationist religious teachings".

Since 1959 however, under the continuous rule of the People's Action Party (PAP) and Lee Kuan Yew's premiership there has been a conscious effort to uplift the poorer communities and to reduce the economic inequalities on the island. The subsequent prosperity of the Muslims and their rehabilitation in newly developed urban areas as well as their programmes of New Generation Mosques (see below), must be seen in this light. The political stability of this island under a leader who has guided the density of Singapore for 30 years is quite unprecedented in Asia where regimes come and go at short intervals.

b. Local Architectural Character

If one looks at a British aquatint view of Singapore dated 1856, at the height of the power of the East India Company (before the British Government moved to take over its functions), one sees a tranquil green tropical island with a tiny cluster of single-storey, red-tiled roof houses crowded on the coast. Palm trees, tropical vegetation and fields surround this post settlement. The harbour is dotted with the small fishing boats so common in this part of the world even today, covered with thatch roofs. The island's architecture, at that time can best be defined as "regional colonial" with a Malay style roof sitting on a rather more sturdy walling which was European in style and decoration. It was the East India Company that virtually created Singapore and since it subsequently became a colony of the British Empire up to 1963, the architecture that appeared on the island was a mixed bag of colonial styles. The British Colonial administrative system constantly shifted its officers from post to post with the result that building programmes often reflected the idiosyncracies of the officer-in-charge. An array of stucco decorative red tile roof architecture emerged for the smaller buildings. The larger administrative complexes were built in the neo-classical style bestowed by the British architects on every Asian capital of the Indian Ocean.

Out of this historical architectural context, under the irrefutable rule of Lee Khan Yew, Singapore has been transformed into a dense, high-rise metropolis. To-day, it is the reinforced concrete tower, built using pre-cast technology, and the highway that dominate the architectural context. The old colonial character can now be found in small pockets of the poorer quarters of the city.

c. Climatic Conditions

Singapore is only 140 km north of the equator. Its climate is therefore humid and equatorial which means that temperatures of about 27°C - 30°C persist throughout the year. Islands in this equatorial belt tend to have a micro climate that is different from that of the mainland. This micro climate is characterised by frequent showers, high winds which come up suddenly and a sky which is seldom clear. The rain falls all the year round, though precipitation increase between October and January, a monsoon of some sort.

d. The Site and its Surrounds

The Darul Aman Mosque is built on a plot measuring approximately 3'500 sq m and the building occupies about half the plot. The setting is completely urban. It is surrounded on two sides by major roads carrying substantial traffic, and adjoining it are a series of high-rise public housing developments called the Eunow Housing Estate; these have been provided as middle cost housing by the Housing Development Board of Singapore. The location of the mosque in the midst of the housing estate is part of the policy of the Housing Development Board to locate community facilities within newly developed areas. The area in which this is located is known as Gelang Town, and the town itself is a mixture of old and new buildings. The new buildings tend to be multi-racial-storey redevelopments whereas the old buildings are tiled, double-storey structures which date back 30 to 40 years. Traditionally, this area was known as a Malay district which means that it was mainly Muslim. With the redevelopment scheme of the HDB and the policy of mixing communities and not allowing specific areas to be occupied by minority communities, the whole area was earmarked for redevelopment and the mosque forms a part of the whole redevelopment scheme. In this process, a plot was created for this mosque; however, the antecedents of this mosque relate to a much smaller mosque called the Amina Mosque which was located on a site through which a road has now been built.

III Description

a. *Formulation of the Programmes, Requirements & Objectives*

The building of the Darul Aman Mosque is part of a broader scheme to build New Generation Mosques. This in turn is part of a more comprehensive scheme that has been unfolding since 1959; through it the entire population of Singapore has been housed, roads and expressways built, new towns created out of the isolated farmlands, enormous areas of land reclaimed from the sea and new industrial estates set up. This mosque being an excellent building is therefore not some isolated achievement but rather part of the enormous and continuous urbanisation programme of the Government of Singapore. The first mosque building programme initiated in 1975 envisaged 6 mosques, and the first of these at Toa Payoh was built privately. However, it soon became clear that such an ambitious programme could not be realised privately. Already, an Act of Parliament had established the Muslim Religious Council of Singapore (MUIS) in 1968. This Council centralised the formal affairs of the Muslim community and advised the President of Singapore on Muslim affairs. The establishment of the MUIS and its role as the fountainhead of Islamic affairs, naturally meant that all building programmes would be handled by it. It established a Mosque Building Fund Scheme in 1975 with the purpose of building multi-racial functional new generation mosques. Under this scheme, each working muslim contributed a minimum of 46 Cents (US$) per month, through an agency, by the end of 1985, Building Fund Scheme had collected US$ 12 million.

With this large fund at its disposal, it was natural within the political context of Singapore for the MUIS to go to the Government for help in obtaining land. The land for these new generation mosques was allotted by the Housing Development Board of Singapore (HDB). With the offer of land came the offer of professional services so that HDB identified the land and provided the professional architectural input. HDB is handling the entire process of urban renewal and the development of new housing estates; this has inevitably resulted in the relocation of some of the traditional places of worship such as mosques and temples.

When Gelang Town (muslim population 20'000), the urban context of Darul Aman Mosque, was redeveloped a small mosque known as the Amina Mosque had to be displaced.

The Amina mosque which was a small community worship place was demolished at the time of developing the estate; the compensation paid to the community for the demolition of this mosque went, in part, to finance the construction of the Darul Aman Mosque. The site, which was selected by the HDB, was allotted after a discussion with MUIS. The architect explained to us that MUIS wished that a prominent location be found for the mosque; this explains the present location at one end of the block of development facing a large open area. This gives it the necessary urban prominence. This prominence, however, may be at the expense of easy pedestrian access which, in this case, is certainly not the best.

The mosque was designed to serve the 20'000 Muslim population of Gelang Town. The total population of Gelang Town is about 200'000, the norm for all the New Towns being designed by the HDB for Singapore.

The Darul Aman Mosque (1986) was designed and built after 6 other mosques had already been completed (Muhajirim 1977, Assyakirim 1978, An-Nur 1980, Al-Muttaqin 1981, Al Ansar 1981, En-Naeem 1983).

The HDB was therefore familiar with the requirement of these mosques. The brief for Darul Aman was no different. The programme of building these new generation mosques had already envisaged a multi-racial-use mosque providing for other functions than prayer. A cursory look at the plans will show that the outlying rooms referred to as "extended prayer hall" act as classrooms for teaching; this is how these spaces are used. Above these rooms, where it states "classroom",

the usage has changed to conference and classroom. The mosque has not been designed to follow to follow a tight functional programme. The functions and spaces are loosely defined and give the users many options.

d. Building Data

Site Area	3'560 sq m
Building Area	2'276 sq m on ground plus two floors. The ground floor occupies 1783 sq m.

In plan, the building seems to be based on a courtyard concept. It has a clear central axis and is symmetrical. The central space is the prayer space and the outer wings provide ancillary spaces. However, the enormous roof over the central space precludes any illusions of being within a courtyard which the plan certainly hints at. The building ensemble is therefore very cleverly assembled, because, at one level, it indicates the courtyard concept of many traditional mosques, and yet at a perceptual level, it is close to the indigenous architecture of this region.

The prayer hall is divided into two parts. The front portion, the smaller hall measures 12 by 15 m while the larger extended hall measures 15 by 15 m. In addition, for friday prayer, spill over space extends to two open courtyards on either side which are 7.5 m wide and extend the length of the hall. Further covered extended prayer halls which double up as class rooms are located on the edge of the site almost equal in area to the courtyards.

The volumetric composition of the building is extremely interesting. The central prayer hall has a ridge height of 14 m and is capped at the *mihrab* end with a pyramidal roof rising to 20 m. The smaller separated buildings on the sides of the hall have lower ridges up to 11 meters and the minaret which rises to 31 m is built as an isolated structure. This play with roof heights, matching the plan size of the buildings give the complex an extremely interesting volume that gives the prominence to the prayer hall apex with its pyramidal roof in lieu of a dome.

e. The Design Concept

The climate of Singapore is hot and humid which means that the humidity stays between 85 - 90%. Enclosed buildings either require air conditioning or large openings permitting sufficient circulation for thermal comfort. It is also a monsoon area, although the rainfall may come daily, there are certain periods in winter when there is a heavier rain fall. The design of the mosque has therefore been conceived specially to suit the climate. There is no doubt that the openness of the mosque enables one to be comfortable without mechanical air conditioning. The other new mosques which have been enclosed, all require to be air conditioned. The success of the design of Darul Aman Mosque in terms of climatic control clearly establishes that open tropical design allows a large number of people to assemble without any discomfort.

The aspect of the building that needs careful consideration is whether it has genuinely moved away from the anonymity of modernism into a regional form. The form is regional to Malaysia. It is a modern building in the Malay regional style. This has been achieved by using sophisticated building technology to obtain a region specific style which evokes a style that was much more domestic in scale. At a more detailed level, the railings and doors also evoke a flavour of "traditional regional". On the other hand, the timber grilles of the galleries, the timber railings to the staircase and the mild-steel railing at the entrance of the mosque all show that the architect has taken great care to consistently follow the concept of evoking traditional construction. He has not tried to copy tradition, but merely to evoke it, and the contemporary building materials have been clearly expressed in the treatment of the details. For instance, the steel box girders of the roof structure which are clearly expressed on the underside of the ceiling, evoke a timber construction, and yet there is no attempt to disguise this as timber.

Landscaping does not form an integral part of the conception of the design. The space left over outside the edge of the building and the surrounding roads has been planted and provides a sort of green relief to the elevation. No doubt, in time, when these trees grow up, they will add a further human scale to this rather fine building.

f. Structure, Materials, Technology

Singapore's building industry is highly sophisticated. In South East Asia, apart from Japan, Singapore surely has the most advanced and automated building industry. The natural consequence of this type of efficiency is that all the designer decisions have to be taken early and reflected in the design drawings. This implies that very little room is left for spontaneous change or for craftsmanship. The HDB has a registry of contractors (which is part of a material registry), and it goes out of its way to help contractors upgrade their construction technology. Quality control is also of a high order.

The design and monitoring of the construction of the mosque was carried out by the Building and Development Division of the Housing Development Board; this body constructs more than 35'000 dwelling units per year. It is all the more remarkable that in the midst of this enormous development work, the HDB is able to provide a very high-class service to cater to the specific needs of the various pockets of Muslims in its housing estates.

The technological approach of the HDB towards the mosque building programme has been clearly stated:

- "The Board introduced hi-tech building materials in the construction of mosques, to reflect a progressive image within the traditional design.

Further, in their design approach too, HDB has clarified its approach :

- "In the building design, the emphasis continues to reflect the architectural flavour of the south-east Asian region. For instance, the Masjid Kampany Siglap is an example of local Malay design in modern form. Traditional Malay motifs and geometric patterns can be found on the building façade, the details on the roof structures and the interior of the building.

  In Temple Estate, the motifs on building parapets, roof water tanks and lift wells are adapted from the design of a Chinese Temple located in the estate."

The Darul Aman Mosque is therefore part of a clear strategy to use the highest technologies to achieve regional architectural styles and to try and move away from box like construction. It is in this light that we must see the use of materials for Darul Aman.

The structural system used in the mosque is reinforced concrete post and lintel with steel box section roof trusses. The roof structure was entirely prefabricated as a rhombic frame truss on the ground and lifted up by cranes.

The main hall has little infill, but the outer buildings have an ill of bricks which has been plastered over with granolithic plaster, so known as washed terrazzo or grit finish.

The materials in the mosque are in a way conventional. The piling under the foundations was made of reinforced concrete, pillars and columns are also made of reinforced concrete. The floors are reinforced concrete covered with ceramic tiles and there is a false ceiling of gypsum board. The tiles on the top of the steel truss have been imported from Italy, and their design was selected to match the traditional Malay house-style. The ancillary fixtures such as railings have been made in a combination of reinforced concrete, timber and steel.

The overall simplicity in the choice of finishes comes across very well and harmonises the whole building from within.

As it is located in the centre of an urban development, there are no significant aspects of the services and utilities which are important for this project. The only really crafted component in the mosque is the *mihrab* which was sub contracted out to a firm of interior furnishers called Ikram Arts Pvt. Ltd; they own a workshop in central Java where Indonesian craftsmen make elaborately decorated furniture for rich homes in Singapore.

g. Origins

Technology	High capital intensive indigenous to Singapore.
Materials	Almost wholly imported as for all buildings in Singapore.
Labour Force	Local.
Professional & Consultants	HDB. The architect who handled the project is a recent migrant from Bangladesh.
Contractors	A local Singapore Chinese Company that has gone into liquidation.

IV. Construction Schedule and Costs

a. Chronology of the Project

02.05.82	Members of Parliament officiate at the selection of the Building Committee for the Darul Aman Mosque. 34 persons plus a chairman are selected.
04.05.82	MUIS officially hands over charge to the Building Committee.
09.07.82	His Excellency Wan Hussain Zoohri names the mosque as 'Darul Aman' one of the names of paradise "House of Eternity". Logo of the mosque is approved.
12.07.82	The committee allocates areas and responsibilities to mobilise collection of funds.
01.01.83	Food festival is held to raise money. A box of pre-cooked food is sold for S$10 on a preordered basis so that there is no wastage.
14.03.83	First donation received from other mosques as part of the compensation money for demolishing the Amina Mosque.
05.10.83	Site is identified by H.D.B. and agreed on by the MUIS.
07.12.83	Sale of umbrellas to collect funds.
09.12.83	HDB erect a sign-board where the mosque will be located on the site.
25.12.83	"Jog-a-walk" led by the Minister Dr. Ahmad Mattan in charge of Muslim Affairs and Environment.
12.02.84	"Jog-a-walk" campaign yields S$70,000.
24.05.84	Fried chicken sale S$9,000 realised.
03.06.84	Foundation laying ceremony presided over by Mufti Syed Isa Mohammed, *qibla* orientation indicated.
21.06.84	Construction work commences.
13.09.84	Calendar sale to raise money.
07.01.85	Minaret construction commences.
30.01.85	130 tonnes of steel truss roofing is placed and fixed on the columns.
19.08.85	Total donation of S$ 400'000 collected.
31.05.86	Donation figure reaches S$ 500'000 (actual cost S$ 2'300'000).
03.08.86	Official opening of Mosque.

b. *Total Cost and Main Source of Finance*

The three sources of finance for the mosque were :

- Compensation for Amina Mosque
- Donations
- MUIS fund for New Mosque.

It was not possible to determine the precise figures that these 3 sources generated. Only the donation figure is precisely known as S$518'996.44. The balance was given by the MUIS fund which included the compensation taken by the MUIS for the removal and demolition of the Amina Mosque.

Direct community involvement took place for the donation collected over a period extending from May 1982 to May 1986 when the Building Committee was in charge. The receipts for the Donations are as follows :

- Personal contribution	160'405		
- Organisation contribution	25'353		
- Collection Boxes	9'517		
- Sale of coupons	79'800		
Total contributions		S$	275'169
- Food sales	23'470		
- Umbrella sales	15'582		
- Jog-a-walk	115'639		
- Calendar sale	20'766		
- Food sales	21'408		
- Sale of Quran, Eid Cards etc.	1'960		
Total of fund raising projects		S$	198,825
Interest from fixed deposits		S$	45'002
Total of community efforts		S$	518'996 (US$ 260'000)
Expenses totalled		S$	110'486 (US$ 55'000)

c. *Qualitative Analysis of Costs*

The breakdown of costs given by HDB is as follows :

Land	S$	400'000
Infrastructure	S$	31'320
Labour	S$	693'011
Materials	S$	1'617'026
Professional fees	S$	173'253

The Actual Cost of S$ 2'310'037 (US$ 1'150'000 comes to S$ 922 (US$ 460) per sq m in 1986. Today the cost of construction would have been S$ 1'400 per sq m. The architect states that his costs were below the prevailing average costs at the time of completion.

d. Maintenance

This is carried out by a modified Mosque Building Committee called the Mosque Management Committee. The annual costs could not be determined but the Mufti assured us that they were very small. The Darul Aman Mosque management committee has taken over from the mosque building committee which has been responsible for co-ordinating the building efforts. The person in-charge of the management committee is a full time executive officer and there is also a full time clerk and five caretakers for the building. The entire maintenance of the building is financed from collections on pillar boxes and the fees collected for the teaching of classes in the madrasa of the mosque. The Islamic Committee is responsible for the religious education of the community and children. The Darul Aman Mosque Committee gives a marriage counselling six month course to unmarried girls for two hours a day and it also gives morning & evening classes to young children. The course lasts up to six years and they are taught the teachings of the Quran and also to read the Quran in Arabic. The fees levied for this work go towards the maintenance of the mosque.

V. Technical Assessment

It is immediately apparent that this mosque occupies a very special place in the hearts of the Muslims of Gelang Serai. They are very proud of it and had many stories about the devotion of the architect to the work. There is no doubt that, throughout the duration of the project, the Mosque Building Committee and the HDB architects worked in close co-ordination. Initially, the architect informed us, the committee wanted a dome whereas he was inclined to build the prototype Indonesian mosque which is without a dome. The architect had visited Indonesia and Malaysia to research regional styles since he himself is from Bangladesh. Eventually the architect was able to convince the community to accept a design without a dome. This is a major triumph because such domes sit rather awkwardly over most of the 15 New Generation Mosques.

Designing religious buildings nowadays is always a rather tricky business. The input of traditional values in the architecture is always a difficult area to explore. The mosque of the Darul Aman has not used any rigid proportional system. Nor has it tried to be very traditional and Islamic. There is the use of motifs and geometric decorations but, by and large, the modern construction technique has dictated the rhythm of the building. The most interesting aspect of the architecture of the building is the that it does not employ any device to separate the sacred realm. There is no walled enclosure outside the mosque. It is easily accessible from two or three sides. One has no doubt that this is a religious building as soon as one enters it. There is peace and calm about it. The architect has very cleverly located the ancillary buildings on either side of the covered hall, and this indeed protects the mosque from excessive traffic noise which is very near to the mosque on two sides. The speakers' system is very clear and the Imams' voice can easily be heard in all parts of the mosque from speakers which have been placed on the pillars. The traffic noise does not in any way interfere with the clarity of the sound.

The prayer hall is extremely comfortable to be in. Undoubtedly, the openness, the tropical breeze and at the same time a sense of enclosure give the prayer hall great tranquillity. The building is a climatic success (we experienced it at different times of the day in varying weather conditions).

The quality of construction is excellent. The building has been carefully detailed and the working drawings testify to the care of the HDB architects. The choice of materials will require a minimum of maintenance. The only material liable for high maintenance may be the roof truss because of corrosive air currents, however, the architect has assured us that epoxy coating will reduce this risk to a minimum. After over 2 years of use, the building shows few signs of deterioration.

VI. Users

The beneficiaries of this mosque are the 20'000 Muslims who inhabit the Gelang New Town area. These Muslims form a cross section of the society and have a wide range of occupations and professions. The Muslim community of this area is quite well off and was able to make significant contributions to the fund. There is no doubt that the mosque is the major community focus for the muslims of this area. Classes are conducted, family advice is given, girls are prepared for marriage, adult education also takes place within the premises of this mosque. Most important of all are the subsidiary functions for the women of the community.

Another significant aspect of Darul Aman Mosque is that it is here that leaders from the Islamic World are often brought for prayer which is testified by the photographs of the mosque management albums.

VII. Persons Involved

Client	MUIS Majlis Ugama Islam Singapore. Mufti Syed Isa B Mohd B Semait.
Architect	HDB's Mohd. Asaduz Zaman, Senior Architect.
Woodwork in *mihrab & Imam's* Chair	Ikram Arts Pvt. Ltd.
Contractors	M/s Guan Hong Construction Co. Pvt. Ltd. Now in liquidation.

Romi Khosla
New Delhi, 30 May 1989