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ON AIR

RELOCATABLE MULTI -MEDIA STATION FOR RTHK

PROGRAMMING REPORT

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1.0 INTRODUCTION

1990s is considered to be an information explosion era. Advanced technologies for information transmission and reception are developed incredibly fast in recent years. Technically we have moved from the novelty years of accumulators, cats whiskers, glowing valves and washing-line aerials to now high quality sound in stereo, miniaturized receivers in the pocket or the vehicle, satellites hovering over the whole planet. Nowadays people require high quality and high speed information channels.

Hong Kong was among the pioneers of the world's first mass communication system. Broadcasting, throughout the years, provided Hong Kong people a fast and economic way for people to have news, information and entertainment.

Broadcasting in Hong Kong will certainly have more challenges in the coming years. Technically the information technology is changing so rapidly that Hong Kong has to keep very hard its leading position in the world. Socially Hong Kong is undergo social and industry transformation. The audience and their interests are transforming. The changes in modes of production in different industry, including broadcasting industry does make a great impact to our society. Politically, as 1997 is approaching, freedom of speech and free flow of information are the main concerns in broadcasting and news release. Culturally multi-media makes use of the advance in technology creating a new culture in the world. The meaning and definition of broadcasting at this time undertake a great challenge.

Symposium on Broadcasting industry of Hong Kong in the 90's

1.1 GENERAL BACKGROUND

Broadcasting industry is under the supervision of Broadcasting, Culture and Sport Branch of Hong Kong government. The regulatory body for Hong Kong's licensed broadcasters is the Broadcasting Authority (BA), which is under the Broadcasting Ordinance. The Television and Entertainment Licensing Authority (TELA) is the executive arm of the BA for monitoring broadcast programs and carrying executive functions on behalf of the BA.

1.1.1 SOUND BROADCASTING IN HONG KONG

At present, there 15 local radio channels serving Hong Kong and two satellite channels serving the Pan-Asia region, including Hong Kong.

Radio Television Hong Kong (RTHK) is Hong Kong's public service sound broadcaster. There are 7 channels out of 15 channels operated by Radio Television Hong Kong. RTHK is charged with maintaining consistently high quality programming, giving emphasis to the production of balanced and objective public affairs programs, and providing minority services as well as a two-channel of communication between the Government and the community.

Commercial Radio was established as an alternative to the public service broadcaster in 1957 and started its broadcast in 1959. It is financed by advertising revenue but is also required to provide balanced entertainment, information and education programs by its 3 channels.

Metro Broadcast started broadcasting in 1991 to provide Hong Kong audience with more choice over three extra channels. Metro Broadcast came up with something new for Hong Kong with its channel-by-channel programming strategy. Its three channels are thematic and the balance of programming is obtained by looking at the Metro as a whole, rather than a per channel basis.

STAR Radio, the first satellite radio in the Pan Asian region, commenced operation in March 1995. It uses the same technology as television channels and is available to over 53 countries. Its first service is a 24-hour music channel with target audience over the age of 25.

1.2 DEFICIENCY IN RTHK

SOUND BROADCASTING OF RTHK

The problems of the existing Radio Division of RTHK are concluded by the analysis of its physical conditions. Detailed observations and studies refers to the chapter *Physical Conditions*. Based on these findings the existing facilities and building are hard to cope with the ever changing and high-technologic nature of broadcasting work. The unique nature of the broadcasting industry induces a series of problems to RTHK. The major deficiencies of existing RTHK include inappropriate image, inadequacy in space and technological aspects, inflexible design and lack of equipment for outdoor functions & activities.

1.2.1 INAPPROPRIATE IMAGE

RTHK is charged with to serve as a two - way channel for the public and government. However, from the architectural point of views the building is unable to establish a friendly and close-to-public image. The location of the building site was selected quite remote from the general public. Basically, there is a strong physical barrier between RTHK and general public resulted from the inappropriate selection of the headquarters location. In addition, the building is a traditional 'boxes in a box' design and it provides no transparency for the general public. Public is unable to have a *native* communication to RTHK. The only tools for the public to contact RTHK is by their own radio and telephone. The architectural languages of the existing building cannot help to promote its friendly and close-to-public image.

1.2.2 INADEQUATE SPACE

The Broadcasting House was originally design for two channels broadcasting some 16 hours a day but now the facilities need to cope with 7 channels broadcasting around the clock. The broadcasting time is increased very much. The total number of programs are also ever increasing. The problem is from the working space is not proportional to and reflecting to the expansion of the number of staff and works. The building does not provide appropriate and enough space for the staff. Some of the temporary working containers are provided to solve the problem of insufficient space. The traditional mode of production, which require a lot of labor forces, are ever intensifying this problem.

1.2.3 INADEQUATE TECHNOLOGY

The rapid development in technology, especially in information technology, in the last few decades changed the standard and the requirements of a broadcasting studio. New technique for better quality in stereo broadcasting and space-saving electronical record library are now available in the market. In order to keep the competitive edge, more advanced technology is needed to upkeep the fast information channel and high quality in acoustics performance.

New technology is now able to re-structure and redefines some basic requirement of a radio station. For example, in the case of *Metro Broadcast*, a large music record library is reduced to just a hard disk of a computer without affecting the quality of music. This new library saves both space and labor forces.

Also, the technology enables a transparent broadcasting studio, in the case of *Metro Broadcast*, in a very noisy and crowded shopping arcade. Broadcasters and public can now not only have 'on-air' communication, but visual interaction.

1.2.4 INFLEXIBLE DESIGN

In order to respond the unique nature of broadcasting industry, building which is able to expand and flexible in adapting new technology is needed. The original design did not seem to address this problem. As a matter of fact this problem was existed in the early 70s when RTHK intended to expand TV production division. However the Broadcasting House cannot cope with this growth. The result was that a separate building was built in Broadcast Drive a hundred meters away from the original building. This is why nowadays the existing three buildings are scattered around in Broadcast Drive.

Inflexible design of the working space in Broadcasting House restricts the expansion of the division. As RTHK continued to growth throughout the years, a serious problem of lacking of working space is resulted.

1.2.5 LACK OF EQUIPMENT FOR OUTDOOR FUNCTIONS & ACTIVITIES

Since the broadcasting activities nowadays need versatile programs. Operators do not only stay in studio, but they have to go out to have outdoor functions like singing concert and public forum to attract more audience. The lacking of appropriate facilities hinder RTHK's development of outdoor functions and activities. The very successful achievement of outdoor broadcasting activities proves the importance of outdoor broadcasting activities. However, just a few cases found throughout the history are far from enough.

Outdoor broadcasting activities are significant to RTHK because:

- it help to promote the image of RTHK as it can really bring the broadcaster close to the audience. It can be a very friendly and welcoming gesture for the public. The proximity of broadcaster and audience are much closer and feeling of intimacy is much enforced. Also there are more chances for the public, maybe even in person, take part in the programs which can make RTHK really public - oriented.

- the place for the outside public forum can be regarded as a place for freedom of speech. *Public forum*, for example, constantly attracts people to express their ideas. The sense of that place changed once the implementation of broadcasting activities although as for a very short while. However, it allows the people who are intentionally or even just passed by this place drop off their ideas before gone.

1.3 TECHNOLOGIC REVOLUTION

1.3.1 CHANGES IN MODES OF PRODUCTION

INDUSTRIAL MODEL VS RE-PACKAGING MODEL

After industry revolution in 1850s, a new form of architecture appeared to reflect the new needs of the society. Factory is the architectural icon of the age of industrial revolution. The fundamental concept of industrial production is the concentration of manpower in the production lines, division of labors and mass production.

Broadcasting industry is basically a kind of industrial production. It involves a lot of people in the production line. From the outline of programs in a channel, conceptual thinking of a particular program, generation of manuscript of a program, production of a program and other post-production editing and special effects involve a large number of people. It is why a traditional broadcasting industry is known as a people industry.

In the time of 1990s, this is an age of information. The accessibility of information is developed in a global sense. The information highway and interactive technology enable remote control of shopping or financial account settlement and many other operations. New technology.does have a great impact on traditional industry, including broadcasting industry.

The mode of production of broadcasting industry is now having a great transformation. The mode of production is moving from a traditional Industrial Model to an information-orientated Re-packaging Model. There are some fundamental differences between traditional Industrial Model and Re-packaging Model. In traditional Industrial Model broadcasting means to schedule, produce and broadcast all the programs. Most of the existing broadcasting channels, including RTHK and Commercial Radio, fall into this category. In Re-packaging mode of production, broadcasting is redefined as the re-arrangement of the programs for broadcasting and generally it does not involve in all of the production. For example, *Star TV* and *Star Radio* is now adapting this mode of production. They do not have works produced in the production studios but channels operate 24-hour non-stop.

As forecasting into the coming future, there will be more and more Re-packaging broadcasters will turn up. It will be one of the major trend for the sound broadcasting industry.

1.3.2 CHANGES IN LINKAGE

PHYSICAL LINKAGE VS ELECTRONICAL LINKAGE BETWEEN RADIO STATIONS AND RECORD LIBRARY

As new technology changes the essential physical relationship between radio station and shared resources, like Record Library. The basic concept of this technology is that all the required material is in form of a electronical message. The staff inside the studio do not need to waste their time to go the Record Library to search the music materials. New technology can enable the staff inside the studio search the required material in a easy and fast way by the electronical network. Studios now need only access to the record library electronically. There is no essential physical relationship between them.

A traditional radio station is known as a 'centralised ' planning and the organization of the studios is locating around the Record Library. Comparing the new technology with the traditional model of a centralized plan with studios arounding a Record Library, like existing RTHK, the organization of a radio station is fundamentally changed.

1.3.3 CHANGES IN WORKING SPACES

CENTRALIZED VS DECENTRALIZED STUDIO

Since the arrangement of a broadcasting studio is now free from the tradition physical constraint, a decentralized approach is replacing the present approach. The traditional radio station is known a buckler working space that the production of the programs are from that 'black box'. However the basic of the broadcasting industry needs the contact and communication between public. The increasing number of the decentralised studios reflect this general trend.

The greatest advantages of a decentralized studio is that it can be closer to the public, more attractive to them and more chances for contact and communication between broadcasters and general public. It may be also possible for more participation of the public in live programs.

1.4 COMPARISON

1.4.1 TABLE OF COMPARISON OF TWO MODES OF PRODUCTION OF BROADCASTING INDUSTRY

The following comparison is based on using the existing radio division of RTHK as a typical traditional centralized Industrial Model vs a typical decentralized Re-packaging Model

	TRADITIONAL INDUSTRIAL MODE OF PRODUCTION	RE-PACKAGING MODE OF PRODUCTION
MAJOR DUTIES AND OPERATION METHODS OF THE BROADCASTER	• production • post-production and editing • broadcasting	• mainly broadcasting
INTERFACE BETWEEN PUBLIC AND BROADCASTER	• depended on only radio and telephone line • voice from blackbox	• depended on radio, telephone and internet • possibility of a transparent glass interface provides visual contact to audience
SOURCES OF INFORMATION AND PROGRAMS	• from in-home production	• packages from others
NUMBER OF STAFF NEEDED	• more	• less
LOCATION OF THE BUILDING	• a fixed large space • not very urban and remote from the public	• a relative small space • can be very urban site or rural site any where, even in some very noisy public areas
SPATIAL ORGANIZATION OF THE BUILDING	• centralized • studios arranged around library and other common resources	• de-centralized • studios preferred to locate some popular place as to attract people
STUDIOS	• centralized • accessible physically to the shared resources • large in size • physically operated • as 'boxes in a box' • no transparency or known as 'black box' operation	• de-centralized • accessible electronically to the shared resources • small in size • electronically operated • can be an attachment to the building • as a transparent showcase
RECORD LIBRARY	• occupied a large space • physically connected to the studios	• occupied a very small space as library is basically a hard-disk of a computer • electronically connected to the studios
NEWS UNIT	• as an independent department • physically connected to the studios	• as a form of package • electronically connected to the studios
OFFICE SPACE	• large as many staff involved in program production and post-production	• small as (almost) no staff involved in program production and post-production
ADMINISTRATION	• need to manage a large number of people	• manage a small number of people
SECURITY	• no major differences, security for a larger campus	• no major differences, but security for a smaller campus
TRANSMISSION	• located and operated in somewhere else	• located and operated in somewhere else
COST EFFECTIVENESS	• high investment cost • high labor operation cost • high management cost • extremely high future upgrade cost	• higher investment cost • low operation cost • low management cost • low future upgrade cost
FLEXIBILITY	• inflexibility, future expansion is very difficult • sub-division of existing space	• flexibility, future expansion is easy • the choosing of site is not restrictive

1.4.2 RESULT OF COMPARISON

The result of comparison can be concluded that the new mode of production is a better choice than the old ones. The decentralized Re-packaging model is more effective and efficient in terms of organization, land uses and flexibility of further development and any major changes.

1.5 RATIONALIZATION

BACK TO BASIC COMMUNICATION -

FACE-TO-FACE COMMUNICATION

There are now many different methods and means of communication are available. Multi-media and cyber space embrace our planet. The advance in information enable any body any time at any location communicates anyone. In a broader sense, modern communication trepasses time and space.

Communication services are in three forms only. They are data(text), image and sound communication. Face-to-face communication transmit all of them. More than that, in face-to-face communication one can communicate another in its most native sense. This native sense is in fact one of the most important sense people look for. No matter how best the technology, face-to-face communication is most important just because it is a human need. The main goal of modern information technology is to aim at fulfilling that need.

1.6 ARCHITECTURAL RESPONSE

RELOCATABLE ARCHITECTURE:

FACE-TO-FACE COMMUNICATION

The discussion in previous section finds that a typical decentralized re-packaging model generally is better than a traditional broadcasting one. As our technology enables portable computer, mobile telephone and other portable facilities make a 'moving' office possible.

The primary goal of RTHK acts as a two - way channel between government and public. The role of RTHK needs to contact public, communicate with them as far as possible as to achieve its stated goal. However, nowadays it falls to achieve its stated goals. (Ref: Deficiency of RTHK) Back to basic, the most native way of communication is a face-to-face communication. The main concept of a relocatable broadcasting architecture is to address this issue. The greatest advantages of a relocatable studio is that it can overcome the site-specific restrictions to contact *more* people in *various* locations. In operation, a relocatable studio can turn up in a number of districts periodically so that people of different districts can keep close contact to RTHK. As a result, physically RTHK and general public can have closer contact and relationship as a better communication channel between the two bodies is provided. A site-specific studio can never do that.

Physically a relocatable radio broadcasting headquarters can make close contact to the public so that there will become a better communication channel. As a result of that, it can help to establish a place for exchange of ideas and hence a place for freedom of speech.

Detailed discussion of comparison of a site - specific headquarters and relocatable studios is in the following chapter.

1.6.2 TABLE OF COMPARISON BETWEEN A SITE-SPECIFIC STUDIO AND A RELOCATABLE STUDIO

The following comparison is based on a decentralized site-specific studio vs the same standard of re-located studio of a Re-packaging mode of production radio broadcasting

	SITE-SPECIFIC STUDIO	RELOCATABLE STUDIO
IMAGE	• static • friendly and intimacy, close to public	• dynamic • more friendly and intimacy, closer to public
LOCATION OF THE BUILDING	• a fixed space • can be a very urban place and close to public	• any possible space • can be very urban site or rural site any where, even periodically turn up
SPATIAL ORGANIZATION OF THE BUILDING	• fixed and less flexible	• relocatable and flexible
STUDIOS	• fixed in a specific location • less choice to meet people • passive in contracting public	• flexible in choosing location and duration • can go from one district to another • active in contracting public
RECORD LIBRARY	• fibre connected to the studios	• fibre or wave connected to the studios
NEWS UNIT	• fibre connected to the studios	• fibre or wave connected to the studios
OFFICE SPACE	• not significant different	• not significant different, but mobile
ADMINISTRATION	• not significant different	• not significant different, but mobile •
SECURITY	• no major differences in daily operation • as an target of attack during protest or in social instability time	• no major differences in daily operation • can be hide away during protest or in social instability time •
ENERGY SOURCE	• electrical	• electrical and fuel
TRANSMISSION	• no difference, located and operated in somewhere else	• no difference, located and operated in somewhere else
COST EFFECTIVENESS	• high investment cost • lower operation cost • high management cost • high outdoor equipment cost • low future upgrade cost	• higher investment cost • low operation cost • higher management cost • zero outdoor equipment cost • low future upgrade cost
FLEXIBILITY FOR FURTHER EXPANSION	• no big difference, flexibility, future expansion is easy	• no big difference, flexibility, future expansion is easy

1.6.3 TABLE OF COMPARISON OF A RELOCATABLE RADIO HEADQUARTERS VS A BROADCASTING VEHICLE (OUTDOOR BROADCASTING BASE, OBB)

This comparison of a relocatable radio headquarters and a broadcasting vehicle (Outdoor broadcasting Base, OBB) is to clarify the fundamental differences between them

	RELOCATABLE RADIO HEADQUARTERS	BROADCASTING VEHICLE (OUTDOOR BROADCASTING BASE, OBB)
CONCEPT	a relocatable broadcasting and administrative center	as an extension of a studio towards outside as a supplement to the deficiency of existing facilities
FUNCTIONS	broadcasting administration communication with public	broadcasting
AIM	to extend public contact to improve communication	to collect information or news to have no communication to general public
INDEPENDENCE	independent complete its goals and duties by itself	dependent meaningless if not depending on studios in headquarters
IDENTITY	can be as an independent, freedom of speech icon	no more than a special-type vehicle
MOBILITY	low	high
IMAGE	dynamic active	dynamic active

1.7 SUMMARY

RELOCATABLE RADIO STATION FOR RTHK

The existing RTHK headquarters was built in 1969, which is now outdated and inadequate to provide best services for the ever increasing and changing functions. The existing workplace of RTHK is inadequate in terms of space and technology, inflexible design and lack of facilities for outdoor functions. Therefore, a new station for RTHK is needed.

RTHK is charged with providing a two - way communication channel between government and community. RTHK acts not only as a public service broadcaster but also as a 'listener' of the public, rather than just a government mouthpiece. New design is to re-establish a closer relationship and better interaction between RTHK and general public.

The changes in modes of production in broadcasting industry indicates a great change in the size and organization of a radio station. Re-packaging mode of production produces no program itself but rearranges program packages. It re-defines the traditional meaning of broadcasting industry. The space needed for a broadcasting architecture is therefore much condensed.

With the advance achievement in information technology, the choosing of location of broadcasting studio can be more flexible. With the opening of Metro Broadcast in 1991 at one of the shopping arcades in Hung Hom, this demonstrates the feasibility of transparent studios in a noisy and public environment. Also the miniaturized equipment and portable computer enable the minimization and mobility of the working space. This technology helps in visualizing a new architectural form of broadcasting studio.

The new facilities has its objectives to establish a better communication base between public and government. Direct physical contact, by all means, is the most direct and native communication methods which can fulfill the human needs. Hence it can allow free flow of news and exchange of ideas. As a result, this architecture is used to reinforce the mandate of RTHK to promote a better relationship between RTHK and public.. There can be more opportunities for RTHK to organize outdoor events to serve the general public. One of the most important features of this studio is that it is able to increase the chance of general public to take part in the radio program, in person, face-to-face to RTHK.

A new multi-media studio for RTHK is proposed to utilize the advantages of mobile broadcasting facilities to order to make closer contact and interaction to the public. The proposed multi-media station includes a radio broadcasting studio, computer networking station, TV station, exhibition station and other working space and supporting facilities which are to provide functions of entertainment and information for the general public.

In order to address those issues, a new form of architecture - a relocatable multi-media station is proposed for RTHK to serve the public.

1.8 METHODOLOGY

The following areas are to be studied to carry out this research.

1) Study of the RTHK
The following information is to be collected for the study and analysis of RTHK:

- The physical conditions of existing buildings
- The organization of RTHK
- The design brief and the existing building organization
- Old Photos of RTHK's buildings at various times
- The architectural drawings of the plans, sections and elevations of the RTHK's buildings
- The establishment, history and development of RTHK

2) Study of the role of Mass Media and the role of RTHK in Hong Kong
The study will be focus on the study on position and role of Broadcasting in Hong Kong at this time and in the future. Special interest is put on the position and role of RTHK in relation to the society of Hong Kong.

- Department of Journalism, CUHK
- Public Relations Department, RTHK

3) Technical Design of Broadcasting Buildings
The study will be included broadcasting and other technologies, especially, the mobile broadcasting technologies..

- Outdoor broadcasting Base, RTHK
- Star TV Station, Hong Kong
- Broadcasting studio acoustic equipment requirements

4) Case Studies on Relocatable Architecture
Precedents study on the relocatable architecture and its ideas, functions and performances.

- Renzo Piano, UNESCO Neighborhood Workshop
- Renzo Piano, IBM Travelling Pavilion

2.0 BACKGROUND

RADIO TELEVISION HONG KONG

2.1 OBJECTIVES

Radio Television Hong Kong (RTHK) is an independent institution and funded by the government. It is charged with providing balanced and objective broadcasting services to inform, educate and entertain the people of Hong Kong.

2.2 ROLES OF RTHK

RTHK paid an extremely important role in the broadcasting throughout the history. At the very beginning it was only amateur English broadcasting studio. Later on it was developed to provide Chinese services to meet the social needs. During the War time, it fell in the hand of Japanese military. At that time RTHK was extreme important for the political reasons. In the sixties RTHK was so important to provide news and information, especially weathering and typhoon forecasting, to reduce the possible damages and losses of the people and their properties. When television program became more popular in the seventies, Education TV programs of RTHK were produced for schools and public affairs TV programs were produced for the general public.

As approaching 2000, satellite services and various advanced technologies are available. RTHK 's program is now available in the internet and distance call for the foreign viewers and audience. There is great impact on the definition of broadcasting in the age of information when people now live and work in the cyber space.

2.3 HISTORY

The history of the establishment and development of Radio Television Hong Kong is summarized as follows:

1923
A group of citizens banded together to form the Hong Kong Radio Society, members of which were to bring an energetic and powerful influence to local radio.

1926
The Hong Kong Radio Society embarked on an ambitious program of test concerts, the object being to entertain members and to show there was scope for a broadcast organization in Hong Kong.

1928
The first broadcasting organization, ZBW - the former 'RTHK,' was established. This was the second British colony in the world which have its broadcasting organization. The date June 30, 1928 marked the beginning of the government sponsored broadcasting and this organization was managed by public. The broadcast was on 355 meters, 845 kilocycles in the medium wave band. Only English channel was provided. That year a total of 124 licenses were sold at $4 each to owners of radio sets.

1929
There was a broadcasting committee appointed under the chairmanship of the then Post master General, Mr L.M. Smith.
The embryo station was moved from the Peak and taken to the old General Post Office where the first serious attempt at constructing a studio took place.
By the end of this year, new services had started, 643 radio licenses had been sold, weather reports were regularly broadcast from a vantage point on the Peak.

1935
In mid-February the number of radio licenses reached 4441.
Broadcasting hours in the small studio were gradually increased and programs included overseas relays from the BBC, light and classical gramophone programs regular news and weather and stock market reports and quotations from Britain and American.
Another major step of the development was the introduction of a Chinese service. The first Chinese channel, ZEK, was established. Although the service at first shared the facilities of ZBW, it soon became apparent that more space would be required. Space was rented in the Glocestor Hostel

1938
A second transmitter was installed and operated for the Chinese Broadcasting. From then, both Chinese and English channel could be broadcast at the same time. A Chinese program director and musical director were appointed. For the first time the people of Hong Kong were offered simultaneous broadcasting.
The Chinese news service was also improved by translating the English items into Cantonese and Mandarin for broadcasting both in Hong Kong and on the shortwave service. The number of radio licenses were increased to more than 8 000.
From 1928 to 1938, the broadcasting committee received a government subsidy of nearly $90 000 a year. It was suggested that broadcasting be administered as a sub-department of the government, provided that the head of the department be advised by a committee similar to the one in existence.

1939
The broadcasting organization was started to be directed by the General Post Officer.

1942
Pacific War started. Hong Kong fell, but the station continued broadcasting in the hands of the Japanese.

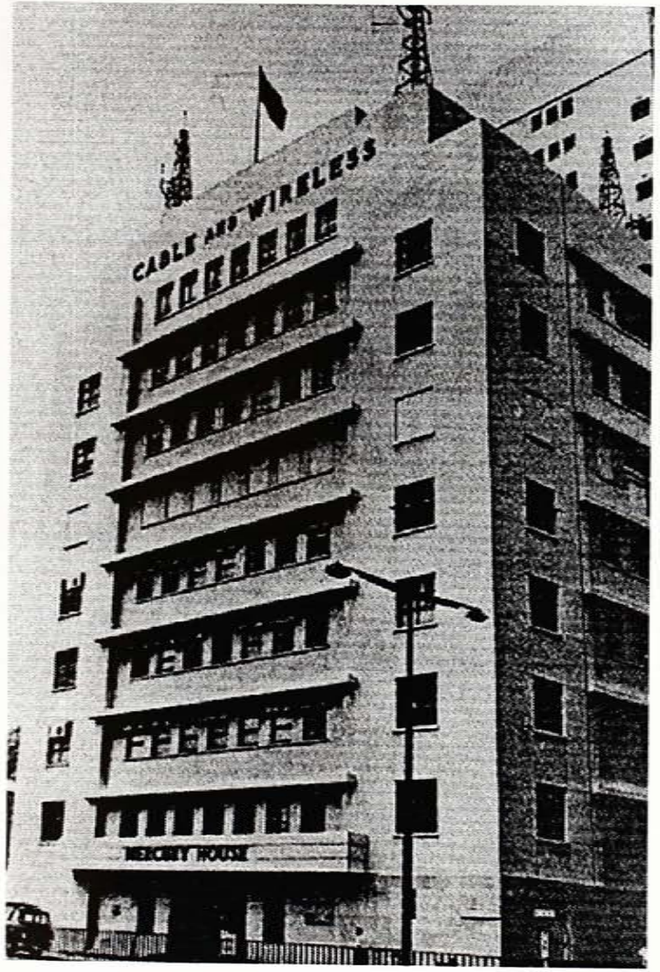
1945
On August 3, the first communiqué from the Hong Kong Government proclaimed the end of the occupation years. Broadcasting activities continued.

1948
In June experimental broadcasts were introduced from 7:30 am to 9:00 pm and proved extremely popular. In August the Hong Kong broadcasting station was given the official title 'Radio Hong Kong' (RHK) and the newly named station celebrated its first 20 years.

1949
At the end of March that year Radio Hong Kong moved from its old premises in Gloucester Building to Electra House, owned by Cable and Wireless. The staff worked late into night carrying equipment down Chater Road and none of the 18 000 gramophone records was broken.
The number of radio licenses were increased to 22 000.

1950
The number of radio licenses were increased to 40 000.
Two 2 KW transmitters were built in Hung Ham.

1951
The broadcasting advisory committee was dissolved and broadcasting came under the aegis of the government Public Relations Officer.
As new techniques in recording on both tape and disc made it possible to build up a library of recorded sound and events.
The new studios in the sixth and seventh floors of Electra (later known as Mercury House) were to home for Radio Hong Kong for nearly 20 years.



Mercury House in 1951

1953
Broadcasting was separated from the Public Relations Office and assumed tentatively for the first time the status of an independent department under a Director of Broadcasting.
The quality of the programs were ever improved and the duration of broadcasting was increased. Broadcasts were nine and a half hours for English channel and seventeen hours for Chinese channel every day.

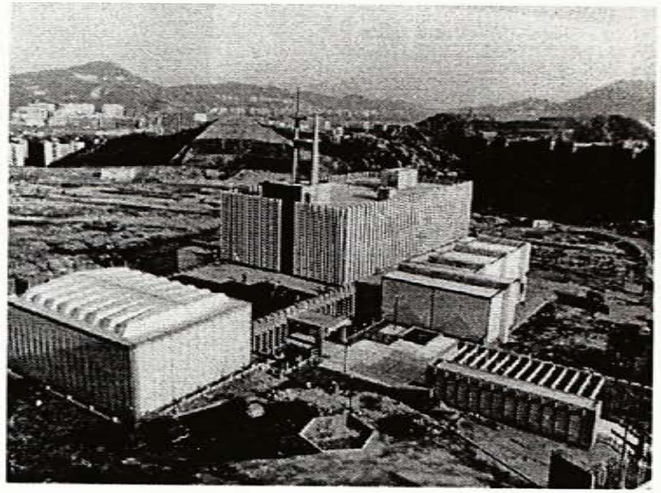
1954
The Colonial Advisory Broadcasting Engineer recommended that Radio Hong Kong discontinue its shortwave transmissions in Asia as the area could be better covered by improved mediumwave transmitters of greater strength. The recommendation to build a new broadcasting station with two 10 KW transmitters using a new 300-foot mast was accepted.

1960
Radio Hong Kong made another stride forward; with the introduction of its VHF / FM service for both the English and Chinese services. The new station was built on Mount Gough on Hong Kong island. The Chinese name for Mount Gough being 'mountain of song and poetry.' The new service meant that reception conditions throughout the Colony improved overnight, and for the first time the English service was able to extend its transmission from eight and a half to seventeen hours a day.

1961
Radio Hong Kong broadcast seven demonstration programs in 'stereo' to mark the first anniversary of FM. Listeners needed two radio sets to receive the broadcast properly - one tuned to the FM service and the other to AM or medium wave service. Transistors, combined with all the improvements in sound quality, were making radio ever more popular.

1965
The number of radio licenses were increased to 13 500. However, it was estimated that there were about 60 000 radio sets in uses. The Government finally abolished the license fees system.

1969
Radio Hong Kong made its first broadcast from the new studios in Broadcast Drive, Kowloon, as its permanent home. The building was four-storey tall with a total area of 5 800 square feet. It consisted of 6 continuity studios, 6 production studios and a special concert studio.



1970
A public affairs television unit of Radio Hong Kong was established. It was to produce public affairs programs.

1973
The independent news and public affairs division of RTHK was established. This department was operated 24 hours a day. News reports was broadcast every hour.

1976
The Educational Television Center of the Education Department was merged with Radio Hong Kong. The word 'television' was added to Radio Hong Kong to reflect the station's ever-increasing involvement in locally produced programs. The new name 'Radio Television Hong Kong'(RTHK) was then used. The production of education television programs (etv) was changed from black and white films to color films for the local secondary students by RTHK. Under the terms of the franchise of the existing television stations provided air time for the government produced programs.
RTHK became the first station in Asia to boast FM stereo and was able to broadcast live stereo performances by Hong Kong Philharmonic Orchestra.

1984
This was the time when Chinese and British government had negotiation on the issue of 1997. Several civic education programs were introduced.

1986
There were broadcasting policy reviews on RTHK. The conclusion was that RTHK still was kept as a government department and funded by government. However government allowed RTHK to have donation from other privates parties.

2.4 ORGANIZATION

The organization of RTHK is consisted of a Director of Broadcasting, a Deputy Director of Broadcasting, five Divisions and a number of special units. There are a total of about 700 staff at present.

Department Administration Division	Production Services Division	Radio Division	Public Affairs Television Division	Education Television Division
Finance & Resources Unit	Cable and Wireless Engineering Division	News and Current Affairs Section	Public and Current Affairs Section Documentary Current Affairs Servicing	School Section
Marketing & Sponsorship Unit	Film & Video Editing Services Section	Chinese Program Service Section Radio 1 Radio 2 Radio 5 Radio 7 Production Unit	General Program Section Drama Variety Special Project	Supplementary Section
Program Development & External Affairs Unit	Studio Service Section	Drama Education Culture Public Affair Unit Presentation Unit		Adult Section
Program Standard & Practices Unit	Art Service Section	English Program Service Section Radio 3 Radio 4 Radio 6		Youth and Children Section
Special Duties Team				

2.5 OPERATION

2.5.1 RADIO CHANNELS

Radio 1

Radio 1 programs focus on information, education and entertainment and has since been accorded with the fame of being a classic model for public radio station. During the past decade, the popular phone-in program *Talkabout* and other public affairs program have emerged as the feature of Radio 1.

Radio 2

The concept of Radio 2 was derived from a program of RTHK - *New Generation* some twenty years ago. The content was inform young listeners of the trend in popular music and cult while at same time enrich them with civic education and information with a lighter note. The channel is to produce more outside broadcast program following the success of its annual *Ten Golden Song Awards*. Another direction is for the channel to involve more in the promotion of social service program.

Radio 3

Radio 3 provides English broadcasting services for expatriates tourists and other English-speaking people. Apart from providing news and information, Radio 3 also has programs incorporated from British Broadcasting Corporation.

Radio 4

Radio 4 is featured by its Fine Music and Arts programs. From 1976, Radio 4 was able to start broadcasting its live stereo performances by Hong Kong Philharmonic. This is the only classical music radio station in Hong Kong. It broadcasts both traditional and contemporary classical music, predominantly western, but also offers the best in Chinese music.

Radio 5

Radio 5 broadcast educational, cultural and minority interest programs like Cantonese opera, provincial music and features in Putonghua. The Care for the Elderly program has now become an annual project and involves visits to various hostels for the elderly by popular personalities.

Radio 6

Radio 6 relays the BBC World Services programs in English around the clock. There are internal news, indepth reports, globe and regular finance and sports bulletins.

Radio 7

Radio 7 broadcasts news summaries and traffic reports at 30 minutes and Financial Data are updated every 15 minutes. This channel plays Chinese and Western Golden Oldies. Due to the changing of the needs of the society, Putonghua services is proposed to use up this channel.

2.5.2 TECHNOLOGY OF TRANSMITTING STATION

The technical services of RTHK are undertaken by Hong Kong Telecom International Ltd, (HKTI) which is responsible for the installation, operation and maintenance of sound and television studios, transmitting and receiving facilities.

Transmitting and Receiving Station

The medium wave transmitting station is at Golden Hill, near the Kowloon Reservoirs. The station was designed, built and equipped, during the period 1966-1968. Two pairs of 10KW Transmitters feed into a single 92 meters mast radiator, giving a total power output of 20 KW per program channel. A standby aerial of height 43m was erected next to the main radiator in October 1982.

The main VHF/FM Transmitting Station is located at Mount Gough on Hong Kong Island. The short-wave Receiving Station which is used to receive BBC World Service from London / Singapore is part of the Hong Kong Telecom International Center at Mount Butler, also on Hong Kong Island.

The main transmission of radio services of Radio Television Hong Kong are as follows.

Radio 1	FM 92.6 - 94.4
Radio 2	FM 94.8 - 96.6
Radio 3	FM 97.9 / 106.8 or AM 567 / 1584
Radio 4	FM 97.6 - 98.9
Radio 5	AM 783
Radio 6	AM 675
Radio 7	AM 621

2.6 PROGRAM

2.6.1 RTHK RADIO 1 - AIR TIMETABLE (as on 14 - 09 - 96)

	MON	TUE	WED	THU	FRI	SAT	SUN
07:00 - 08:00	NEWS WORLD						BBC NEWS
08:00 - 09:00	TALKABOUT						NEWS WORLD
09:00 - 10:00							WEEKLY SPECIAL
10:00 - 11:00	GOOD MORNING EVERYBODY						FLASH
11:00 - 12:00							
12:00 - 13:00	NEWS WORLD						
13:00 - 14:00	HAPPYLINE					DYNAMIC TOUCHING	REMEMBER THAT
14:00 - 15:00							
15:00 - 16:00	NEWSRAMA					SUPER MARIO	HAPPY GUYS
16:00 - 17:00							
17:00 - 18:00						HAPPY GUYS	
18:00 - 19:00	NEWSWORLD						
19:00 - 20:00	'WARM FUN'					TOMORROW'S SUNDAY	EVENING'S LOVE
20:00 - 21:00	PUTONGHUA					OLD WINE, NEW BOTTLE	5000 YEARS OF CHINA
21:00 - 22:00						30, BROADCASTING ROAD	TALKING
22:00 - 23:00	HONG KONG SPIRIT					POLITICAL FORUM	100% CHAN YAM
23:00 - 00:00	NEWS WORLD						
00:00 - 01:00	SKY, MOON, STARS, SUN					ONE-NIGHT LOVE	TRUE LOVE
01:00 - 02:00							
02:00 - 03:00	WHISPERING, SINGING OVERNIGHT						
03:00 - 04:00							
04:00 - 05:00							
05:00 - 06:00							
06:00 - 07:00	DAWN					SATURDAY'S MORNING	SUNDAY'S MORNING

2.6.2 RTHK RADIO 2 - AIR TIMETABLE (as on 14 - 09 - 96)

<table>
<tr><th></th><th>MON</th><th>TUE</th><th>WED</th><th>THU</th><th>FRI</th><th>SAT</th><th>SUN</th></tr>
<tr><td>06:00 - 07:00</td><td colspan="5" rowspan="3">DAWN</td><td>SATURDAY'S MORNING</td><td>SUNDAY'S MORNING</td></tr>
<tr><td>07:00 - 08:00</td><td rowspan="2">WEEKEND ' HUA CHEE'</td><td rowspan="2">MUSICAL FEELING</td></tr>
<tr><td>08:00 - 09:00</td></tr>
<tr><td>09:00 - 10:00</td><td colspan="5" rowspan="3">CRAZY SHOW</td><td rowspan="2">AN HOUR MORE</td><td rowspan="2">TALK THIS AND THAT</td></tr>
<tr><td>10:00 - 11:00</td></tr>
<tr><td>11:00 - 12:00</td><td rowspan="2">CHINESE MUSIC CHART</td><td rowspan="2">GLOBAL MUSIC CHART</td></tr>
<tr><td>12:00 - 13:00</td><td colspan="5" rowspan="2">SMALL WORLD</td></tr>
<tr><td>13:00 - 14:00</td><td rowspan="2">A FUNNY GAME</td><td rowspan="2">J TALKING</td></tr>
<tr><td>14:00 - 15:00</td><td colspan="5">TRY IT</td></tr>
<tr><td>15:00 - 16:00</td><td colspan="5" rowspan="2">ENTERTAINING STARS</td><td rowspan="2">THREE WOMEN & A MAN</td><td rowspan="2">BREAKING ZERO</td></tr>
<tr><td>16:00 - 17:00</td></tr>
<tr><td>17:00 - 18:00</td><td colspan="5" rowspan="2">OPEN VIEW OPEN LINE</td><td colspan="2" rowspan="2">LAZY EVENING</td></tr>
<tr><td>18:00 - 19:00</td></tr>
<tr><td>19:00 - 20:00</td><td colspan="5" rowspan="2">MUSIC EVERYWHERE</td><td>OVER HONG KONG'S STAGE</td><td>TECHNICAL U-FILE</td></tr>
<tr><td>20:00 - 21:00</td><td>METROPOLITAN CULTURE</td><td>FAIR TRADING</td></tr>
<tr><td>21:00 - 22:00</td><td colspan="5" rowspan="2">MASTERPIECE MUSIC</td><td rowspan="2">COMPUTER WORLD</td><td rowspan="2">YOUTH HOTLINE</td></tr>
<tr><td>22:00 - 23:00</td></tr>
<tr><td>23:00 - 00:00</td><td colspan="7">NEWS WORLD</td></tr>
<tr><td>00:00 - 01:00</td><td colspan="5" rowspan="2">SKY, MOON, STARS, SUN</td><td rowspan="2">ONE-NIGHT LOVE</td><td rowspan="2">TRUE LOVE</td></tr>
<tr><td>01:00 - 02:00</td></tr>
<tr><td>02:00 - 03:00</td><td colspan="7" rowspan="4">WHISPERING, SINGING OVERNIGHT</td></tr>
<tr><td>03:00 - 04:00</td></tr>
<tr><td>04:00 - 05:00</td></tr>
<tr><td>05:00 - 06:00</td></tr>
</table>

3.0 PHYSICAL CONDITIONS

3.1 REGIONAL CONTEXT OF KOWLOON TONG

Kowloon Tong district is located at the middle part of Kowloon. Generally it is a gentle slope land with considerable buildable land. In the north part of this area is the Broadcast Drive, which is a sloppy area with a higher altitude than the south part. Two mountains are located in northwest and north of the area. Beacon Hill is a housing area. Lion Rock Mountain, which is the tallest mountain in Kowloon is located at the north of Kowloon Tong district. The other side of the Lion Rock Mountain is Shatin and the New Territories districts. The major connection to the New Territories from there is by vehicles and trains passing through tunnels of the mountains.

Kowloon Tong is comprehensive in land uses. The land uses of this area are for the purpose of broadcasting activities, traffic interchange, housing, motel, hospital, military forces and education. A large shopping arcade is now under construction.

Map of Kowloon Tong

Broadcasting activities are one of the characteristics in this district. In the 70s all the five broadcasters had their headquarters located in Broadcast Drive, Kowloon Tong. Now there are three broadcasting headquarters, the Asian Television (ATV), the Commercial Radio (CR) and the Radio Television Hong Kong (RTHK) located in this district.

ATV Headquarter

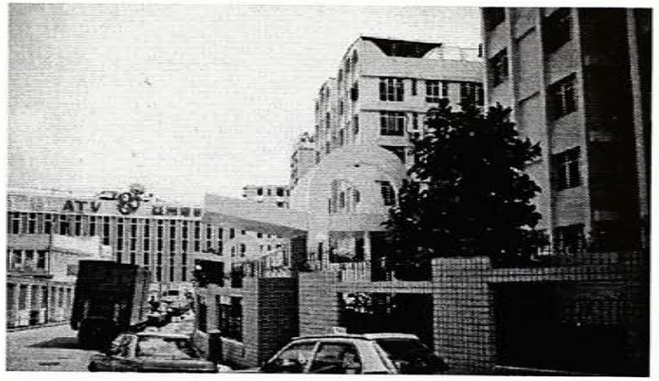
Commercial Radio Headquarter

Kowloon Tong is a dynamic place. Airplanes are frequently across this district. This area is the transportation interchange for the Mass Transit Railway (MTR) and the Kowloon Canton Railway Corporation (KCRC). Thousands of people riding KCRC trains from the New Territories to Kowloon or Hong Kong Island by MTR need to exchange in there. It makes the districts always busy and crowded with people.

Housing blocks in this district are distinctive in design and form. All the housing blocks are mid-rise buildings which are consisted of four to eight storeys. The present situation may be due to the airplane restriction. However, the government is intended to keep this district as a low density housing area even after the removal of the present airport. Motel blocks in this district share a similar housing form but with a more fantastic and decorative outlook.

The schooling facilities in this district are more than enough to serve Kowloon Tong only. There are some secondary schools and, remarkably, two universities in this area. Hong Kong Baptist University has the academy blocks spread over this area and the City Polytechnic University has a rather unified campus.

Kowloon Tong KCRC Station



Distinctive Housing Block in Kowloon Tong

Hong Kong Baptist University

There are several hospitals in this area. They provide services for the whole region. Military campings in this district occupy considerable area of land. However, there are only several small open areas in Kowloon Tong.

Kowloon Tong MTR Station

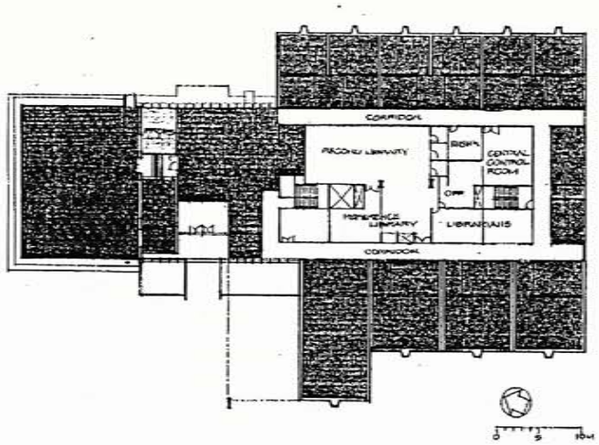
3.2 SITE AND FACILITIES

The headquarters of RTHK is located at Broadcast Drive, Kowloon Tong. This is a one-way sloping ring driveway. This is about 25 minutes walk from the MTR station or 10 minutes by mini-bus. The three buildings of RTHK are located around Broadcast Drive. They are Broadcasting House, Television House and Education Television (ETV) Center. Each of the buildings performs different function.

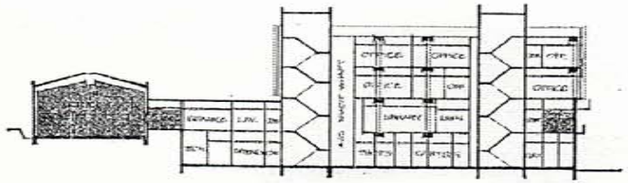
3.3 BROADCASTING HOUSE

The Broadcasting House is designed to join various elements together block by block. It consists of four storeys with a total area of 4 926 m^2.
The main block consists of a basement, with all the engineering services and maintenance rooms, air-conditioning plant rooms, transformer and electric sub-station rooms, outside broadcast base (OBB) depot, staff canteen and kitchen, as well as storage room, photographic darkroom, film services office and record library archives.
On the ground level there is the record library and a reference library at the center, with 1 self-operation studio, 6 continuity suites and 4 production studios grouped around it on three sides. The fourth side is the entrance lobby, the other side of which is a large multi-purpose production studio of 223 m^2. Both these two areas are single-storied. The central control room, tape recovery / dubbing room and reception counter are also on this floor.
Above the library are two floors of offices for administrative and production staff. There are 1 self operation studio and facilities for program staff.
Vehicular entrance is by two ways. Guests and staff entrance is at the upper part at the ground level as the main entrance. Service vehicles and technical staff enters via the lower, basement entrance. Parking is provided at both locations.

RTHK Headquarter



GROUND FLOOR PLAN



SECTION

3.4 TELEVISION HOUSE

The Television House is the headquarters of the Television Division. The five-storeys building houses the Administrative Unit, the TV Program Unit (except ETV), the Production Services Unit and the TV Engineering Unit. The Central Apparatus Area together with the Editing Suites and Sound Transfer Suites are located on the second floor. The three studios are on the ground floor and the associated control rooms are on the first floor. The three basements accommodate Film Editing Unit, the Art Services Unit, the Studio Services Unit and the Tape Library.
Two studios, measuring 200 m^2 and 150 m^2, are fully equipped for television productions. Another one, also measuring 150 m^2. Is not equipped and is being used as 'drive-in' studio with the Mobile Production Unit (MPU) serving as a Control Room when the latter is not used for outside-broadcasts.

RTHK Television House

3.5 EDUCATION TELEVISION CENTER

The building site of ETV Center is conveniently located next to ATV station. The station is a small two storeys block with a total site area of 2 386m^2. The total TV studio area is 343m^2 which was completed in 1971. The organization of building is compact and simple.
On the ground floor, the two production studios are grouped in the center. The main technical suite is at the front and scenery area at the back. The other side of the studio is flanked by the artist's rehearsal rooms and make-up area.
The mechanical and electrical plants are installed in the basement so as to take advantage of the steep fall of the site and to keep the machinery vibration and noise isolated from the studios.
Separate entrances are provided for the carpentry, scenery workers and the production and administration staff who enter through the front lobby. Internal circulation is along a main central corridor linking the front and the back staircases. Parking area is provided around the building.
On the first floor is located the administrative offices, technical area and supporting services such as the graphic room and science preparation room.

Education Television Center

4.0 THE PROPOSAL

This project is to design a new relocatable station for one of RTHK's channels which can work effectively and efficiently to serve the public.. This architecture is also to be served as a prototype for other broadcasting stations.

4.1 MISSION

- To improve the interaction between Hong Kong people and Hong Kong / Chinese Government by improving the role of RTHK

4.2 GOALS

- To improve the communication channels between Hong Kong people and Hong Kong / Chinese Government, since RTHK can serve as a two - way channel, by a decentralised station approach
- To redefine the role of RTHK in the age of information and explore an appropriate architecture
- To create an environment in which can enjoy Freedom of Speech and Free Flow of Press.

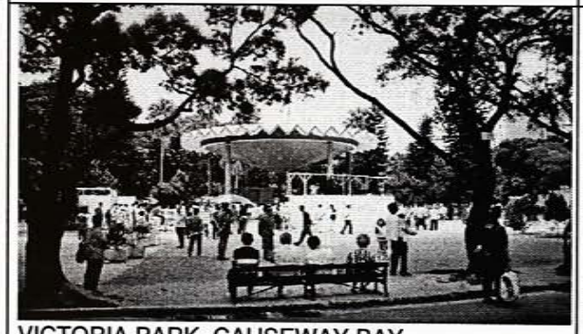
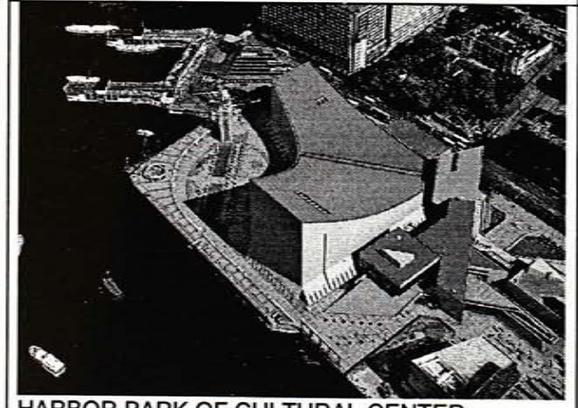
4.3 OBJECTIVES

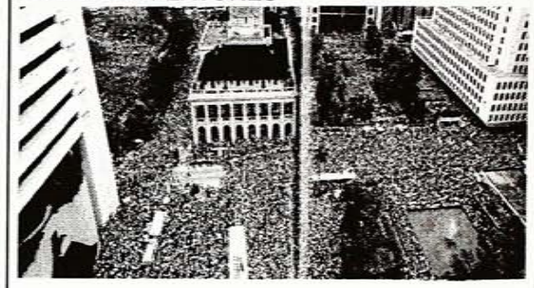
- To design a new station which will be a new icon of an independant governmental department to serve the public.
- To increase transparency of the operation of RTHK as to demonstrate the democracy of a governmental department
- To design flexible systems for new RTHK which can allow future expansion and ready for technologies improvement.
- To design a prototype station for one of the RTHK's channels which can be applied to other broadcasting institute
- To improve and enlarge the existing working environment of RTHK's staff
- To free up a chance of open up the existing record library and the other restricted facilities for the general public without disturbing the normal operarion of RTHK

4.4 PERFORMANCE REQUIREMENT

- Relocable Broadcasting Station is to promote better communication between RTHK and public of different districts.
- Relocatable Broadcasting Station can be relocated in different districts to perform outdoor broadcasting functions which can allow more audience participate in the live programs.
- Relocatable Broadcasting Station is to perform the existing broadcasting functions such as programs arranging from 1 DJ to a 4 people panel decision as the existing facilities may be dedicated for the general public's uses.
- Relocatable Broadcasting Station can be flexible enough to perform media functions such as networking programs if desired.
- Relocatable Broadcasting Station can be extensble to hold a mini-concert or public forum with public participants.
- Office areas and Broadcasting Studios can be highly visuable from outside which allows visual connection between RTHK and public.
- A well-developed roofing system should protect the station from weathering when staff is moving from one functional space to another.
- The supporting facilities, such as toilet and pantry, should be suitable for normal operation of the station.
- The architectural form of the Relocatable Broadcasting Station should be visible and indentifiable from a distant.
- All the building components should be demounted and remounted fairly quickly without involving unaffortable special skills.
- All the largest builiding componants should be able to be transported by the maximum sized vehicles without making traffic problems.
- Building Systems, such as the air-conditioning systems, should fulfill the noise critia of a broadcasting studio.
- The Studio should archieve as a improvement of the existing standard.
- A energy supply unit / any other mean of energy supply other than local power company supply, should be provided as an alternative solution for the energy source of the building.

4.5 SITE OPPORTUNITIES

LOCATIONS	TARGET AUDIENCE	EQUIPMENT TO BE CARRIED	COMMENT
 OPEN PLAZA OF SCIENCE MUSEUM	• YOUTH • STUDENTS • SCHOLARS •	• STUDIO EQUIPMENT • TRANSMISSION EQUIPMENT • ENERGY SOURCE • PANTRY • TOILET	• A VERY NICE OPEN SPACE
 VICTORIA PARK, CAUSEWAY BAY	• OLD PEOPLE • FAMILY • FILIPINO •	• STUDIO EQUIPMENT • TRANSMISSION EQUIPMENT • ENERGY SOURCE	• A VERY NICE OPEN SPACE
 HARBOR PARK OF CULTURAL CENTER	• YOUTH • STUDENTS • BUSINESSMAN • WORKING CLASS	• STUDIO EQUIPMENT • TRANSMISSION EQUIPMENT • ENERGY SOURCE • PANTRY • TOILET	• CAN BE A VERY BUSY PLACE, ESPECIALLY AT NIGHT

LOCATIONS	TARGET AUDIENCE	EQUIPMENT TO BE CARRIED	COMMENT
 STATUE SQUARE, CENTRAL	• POLITICIAN • ASSOCIATION MEMBERS • BUSINESSMEN • MIDDLE-CLASS • FILIPINO	• STUDIO EQUIPMENT • TRANSMISSION EQUIPMENT • ENERGY SOURCE • PANTRY • TOILET	A VERY UNIQUE PLACE WITH STRONG POLITICAL FEATURES 
 PLAZA OF PUBLIC ESTATES	• FAMILIES • STUDENTS • HOUSEWIVES • OLD PEOPLE • WORKING CLASS PEOPLE	• STUDIO EQUIPMENT • TRANSMISSION EQUIPMENT • ENERGY SOURCE • PANTRY • TOILET	A VERY NICE PLACE FOR APPROACHING LOWER CLASS PEOPLE /PUBLIC 
 PLAZA OF CENTRAL PLAZA	• BUSINESSMAN • OFFICE WORKERS • WORKING CLASS	• STUDIO EQUIPMENT • TRANSMISSION EQUIPMENT • ENERGY SOURCE • PANTRY • TOILET	CAN BE A VERY PLACE DURING WORKING HOURS

LOCATIONS	TARGET AUDIENCE	EQUIPMENT TO BE CARRIED	COMMENT
 INTERIOR OF SHOPPING ARCADE	• YOUTH • TOURISTS • BUSINESSMAN • OFFICE WORKERS • WORKING CLASS	• STUDIO EQUIPMENT • TRANSMISSION EQUIPMENT	• MOST OF THE SERVICES CAN BE ACCESSED FROM THE EXISTING FACILITIES • CAN BE VERY DIFFICULT FOR TRANSPORTATION
 PLAZA OF CENTRAL PLAZA	• OLD PEOPLE • TOURISTS • FAMILIES	• STUDIO EQUIPMENT • TRANSMISSION EQUIPMENT • PANTRY • TOILET • ENERGY SOURCE	• CAN BE VERY DIFFICULT FOR TRANSPORTATION
 PLAZA OF CENTRAL PLAZA	• BUSINESSMAN • OFFICE WORKERS • WORKING CLASS	• STUDIO EQUIPMENT • TRANSMISSION EQUIPMENT • PANTRY • TOILET • ENERGY SOURCE	• CAN BE A VERY DIRTY PLACE THAT MOST PEOPLE DO NOT WANT TO STAY LONG • TOO CROWDED

4.6 SCHEDULE OF ACCOMMODATION

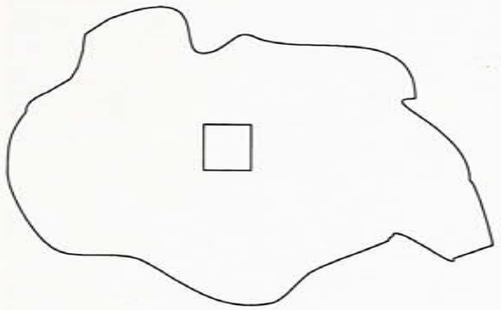
FUNCTIONS	TYPES OF SPACE	USES OF SPACES	PRIORITY NEEDS	SPATIAL REQUIREMENT (M^2)	SUB-TOTAL(M^2)
RADIO BROADCASTING	BROADCASTING STUDIO	BROADCASTING STUDIO (for 4 person up)	PRIMARY NEEDS (essential even for few hours performance)	12	
		CONTROL ROOM	PRIMARY NEEDS (essential even for few hours performance)	4	16
TECHNICAL SUPPORTING SYSTEMS	TECHNICAL REQUIREMENT	GENERATOR & REGULATOR	PRIMARY NEEDS (essential even for few hours performance)	12	
		AIR-CONDITIONER PLANT ROOM	PRIMARY NEEDS (essential even for few hours performance)	4	
		TRANSMITTER	PRIMARY NEEDS (essential even for few hours performance)	AS APPROPRIATE	
		RECEIVER	PRIMARY NEEDS (essential even for few hours performance)	AS APPROPRIATE	16
COMPUTER-NET BROADCASTING	PUBLIC-ACCESS COMPUTER STUDIO	COMPUTER NETWORKING CENTER	SECONDARY NEEDS (needed for few days setup performance)	36	
	COMPUTER CONTROL ROOM	NETWORKING CONTROL CENTER	SECONDARY NEEDS (needed for few days setup performance)	4	40
SUPPORTING FACILITIES	FACILITIES	TOILET	SECONDARY NEEDS (needed for few days setup performance)	3	
		PANTRY	SECONDARY NEEDS (needed for few days setup performance)	3	6
MULTI - FUNCTIONAL ROOM	GENERAL OFFICE / ENGINEER OFFICE / MEETING /	STAFF WORKING SPACES / MEETING AREA /	SECONDARY NEEDS (needed for few days setup performance)	6	
	SUPPORTING	DINNING AREA / REFRESHMENT	SECONDARY NEEDS (needed for few days setup performance)	6	12
TECHNICAL SUPPORTING SYSTEMS	TECHNICAL REQUIREMENT	TECHNICAL EQUIPMENT SPACE	SECONDARY NEEDS (needed for few days setup performance)	12	
		NETWORKING SERVICES COMPUTER	SECONDARY NEEDS (needed for few days setup performance)	4	16

FUNCTIONS	TYPES OF SPACE	USES OF SPACES	PRIORITY NEEDS	SPATIAL REQUIREMENT (M^2)	SUB-TOTAL(M^2)
TELEVISION BROADCASTING	BROADCASTING CONTROL ROOM	BROADCASTING CONTROL ROOM	TERTIARY NEEDS (needed only under special circumstances)	12	
	CHANGING ROOM	DRESSING SPACE	TERTIARY NEEDS (needed only under special circumstances)	6	
	PREPARATION ROOM	MAKING-UP ROOM	TERTIARY NEEDS (needed only under special circumstances)	12	
	PRODUCTION EQUIPMENT (e.g. CAMERA, LIGHTING, MIC, etc)	STORAGE	TERTIARY NEEDS (needed only under special circumstances)	24	54
EXHIBITION / EDUCATION	EXHIBITION / DISPLAY AREA	RELOCATABLE EXHIBITION AREA	TERTIARY NEEDS (needed only under special circumstances)	24	
		TELEVISION SHOWCASE	TERTIARY NEEDS (needed only under special circumstances)	4	28
TECHNICAL SUPPORTING SYSTEMS	TECHNICAL REQUIREMENT	SOLAR ENERGY EQUIPMENT	TERTIARY NEEDS (needed only under special circumstances)	AS APPROPRIATE	
				TOTAL	188 M^2

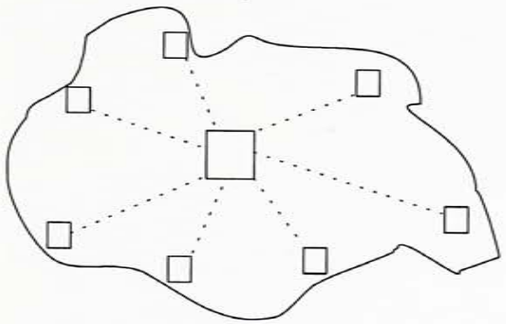
5.0 DESIGN REPORT

5.1 CONCEPTS

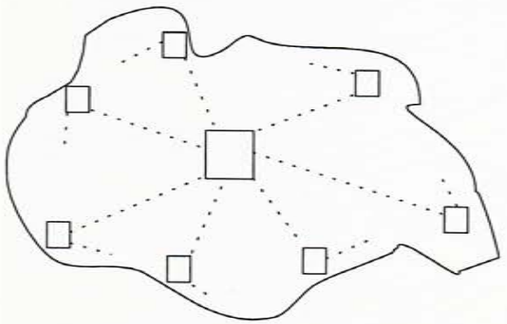
5.1.1 RELOCATABLE BROADCASTING CONCEPT



CENTRALISED PLANNING

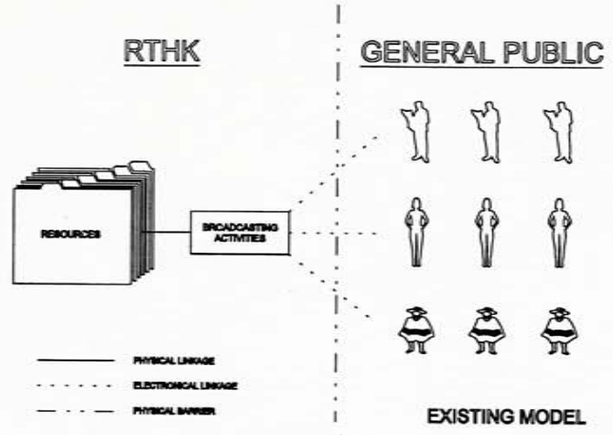


DECENTRALISED PLANNING

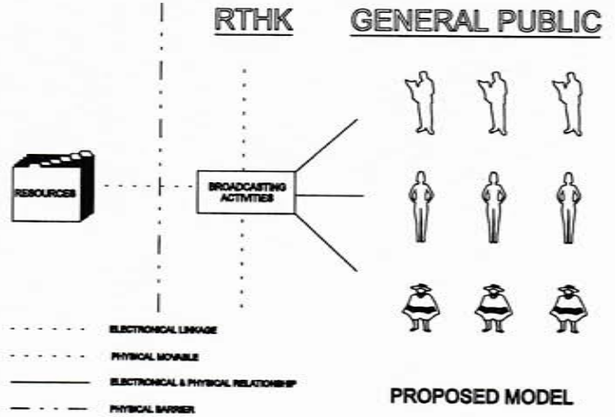


RELOCATABLE PLANNING

5.1.2 NEW MODEL VS EXISTING MODEL



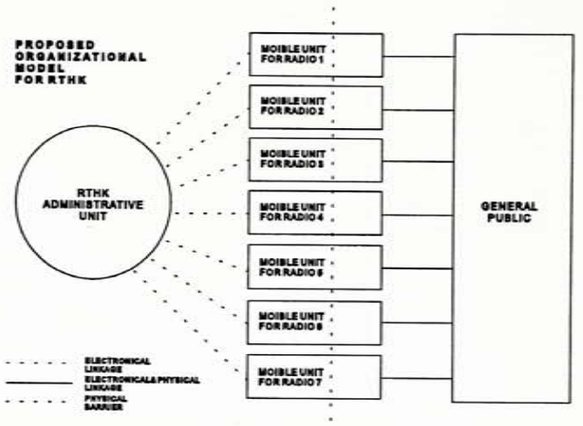
EXISTING MODEL



PROPOSED MODEL

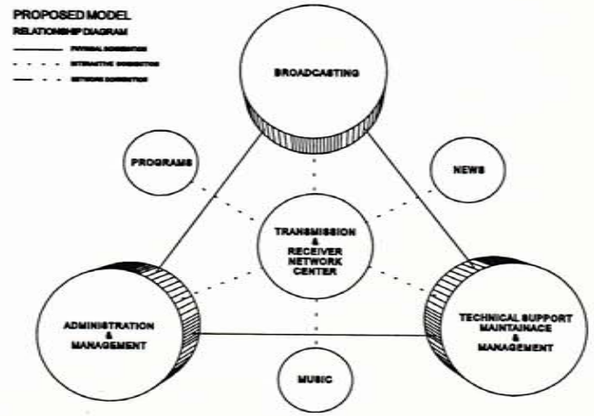
The essential differences between the proposed model and the existing model is that the linkage between the people and RTHK is changed. The exsting model of RTHK depends only on electromagnetic waves or telephone line to communicate with the public. However, in the proposed model it takes the advantages of the modern technologies to have physical contact between RTHK and general public.

5.1.3 NEW ORGANIZATION FOR RTHK



Since the mode of production is changed, new RTHK's organization will not be similar to the existing one.. For each radio channel, there will be an independent station operating independently.

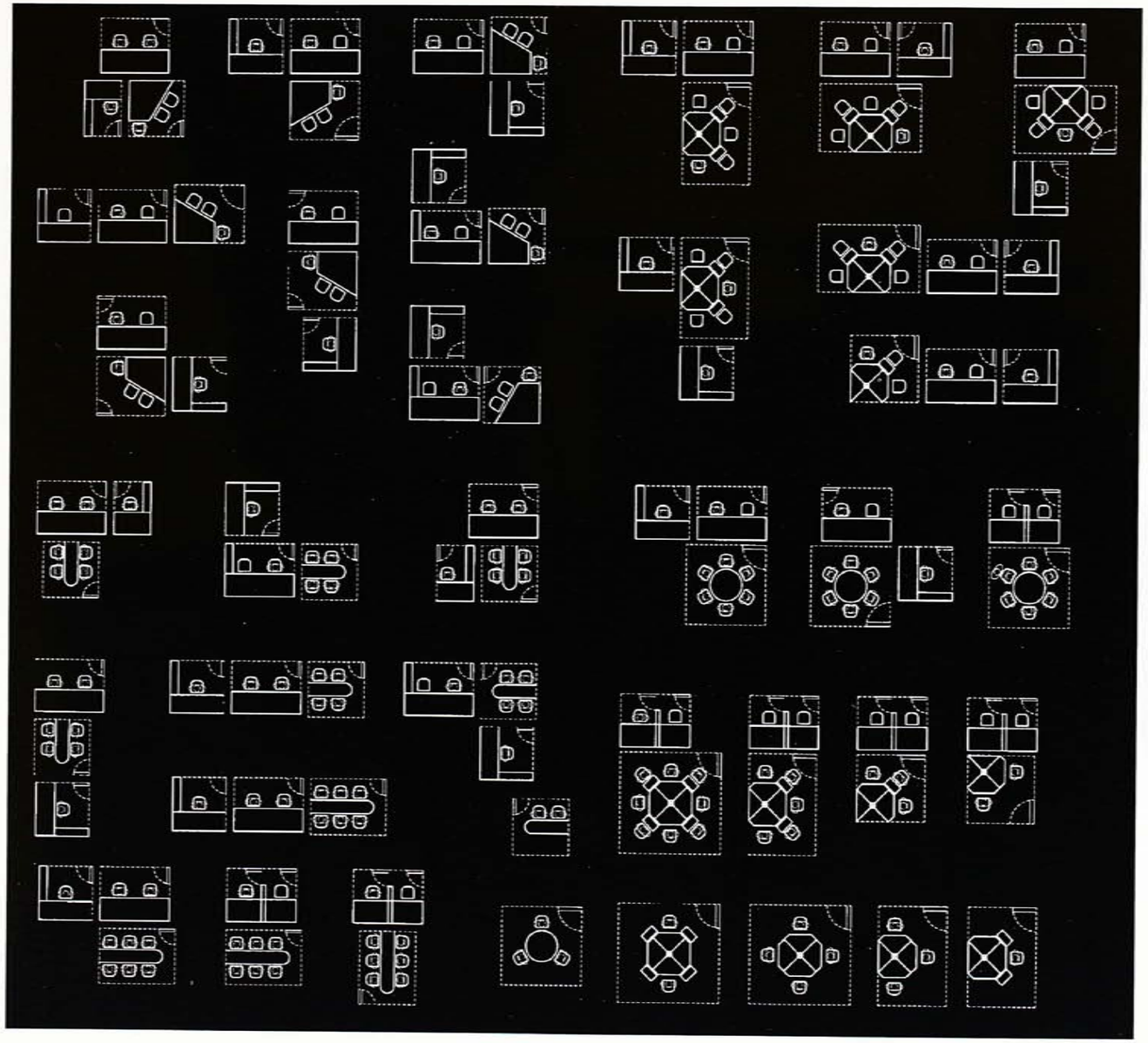
5.1.4 PROPOSED NEW MODEL OF RTHK'S STATION



The proposed basic unit of RTHK's station is to perform broadcasting functions. Each basic unit is for one of the radio channels. RTHK is more than just a radio channel and other media activities would also be part of the duties of RTHK. This unit is able to extend to accomodate other media to perform different functions.

5.2 DESIGN DEVELOPMENT

5.2.1 SPACING STUDIES

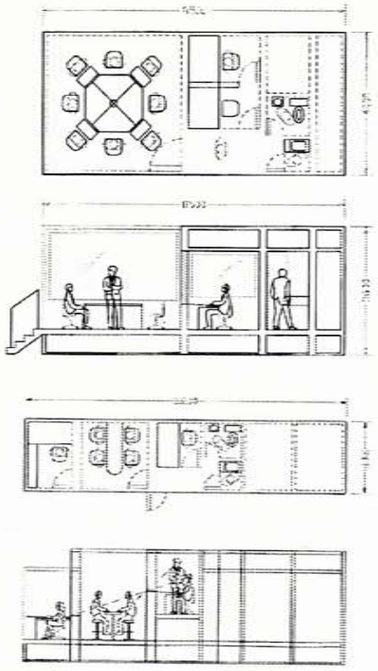


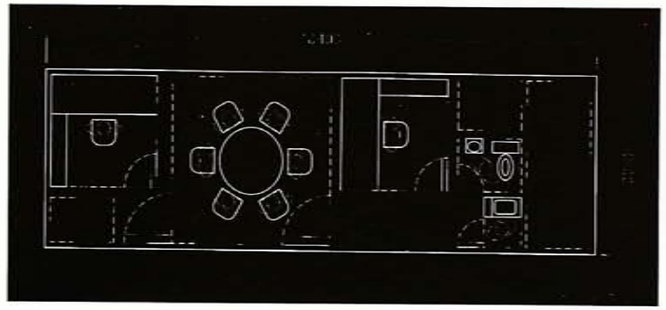
5.3 DESIGN OPTION

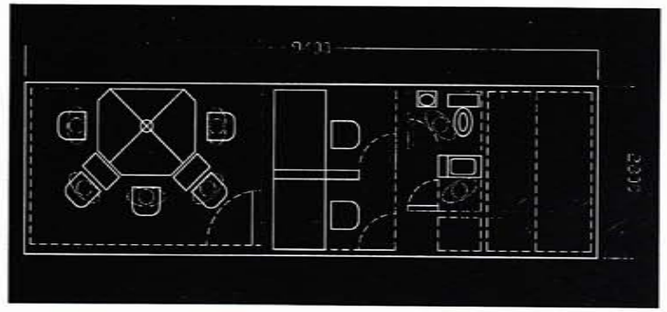
5.3.1 DESIGN OPTION 1

CONCEPT

The concept is to house all the primary-needed elements into a single unit.



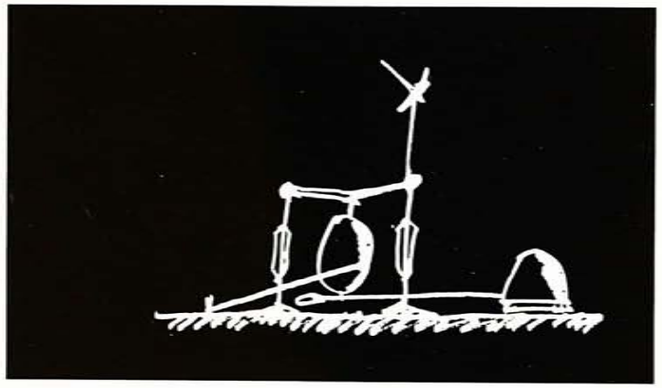


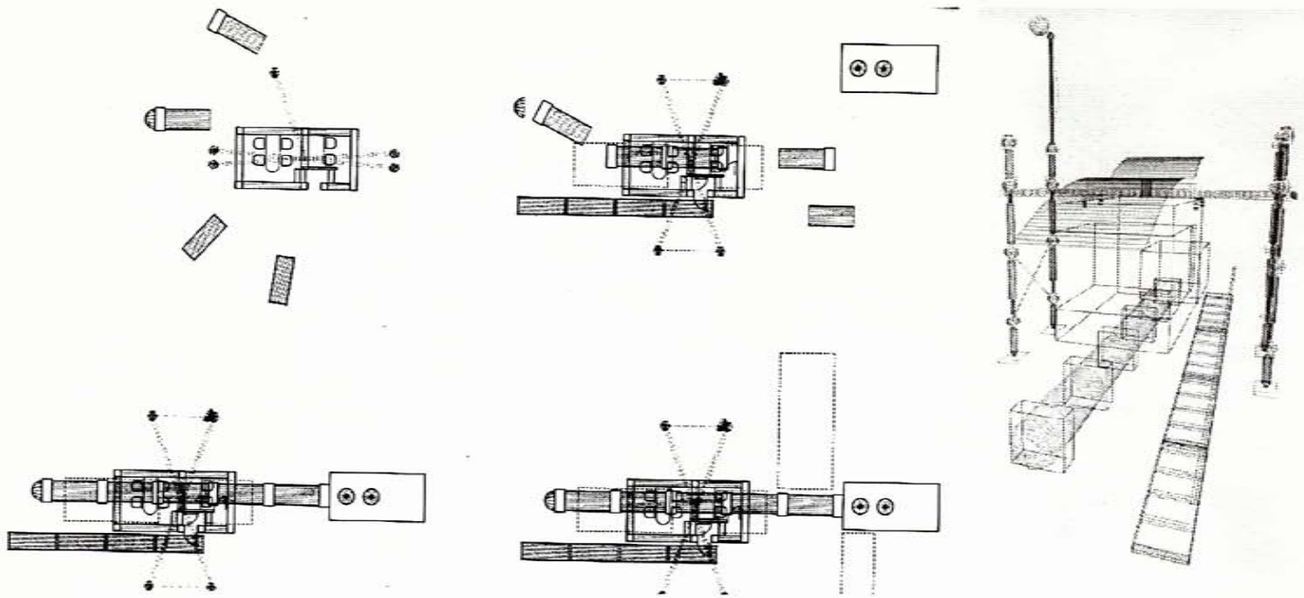


5.3.2 DESIGN OPTION 2

CONCEPT

The concept is to construct different components for different functions and assembly them in a logical way.

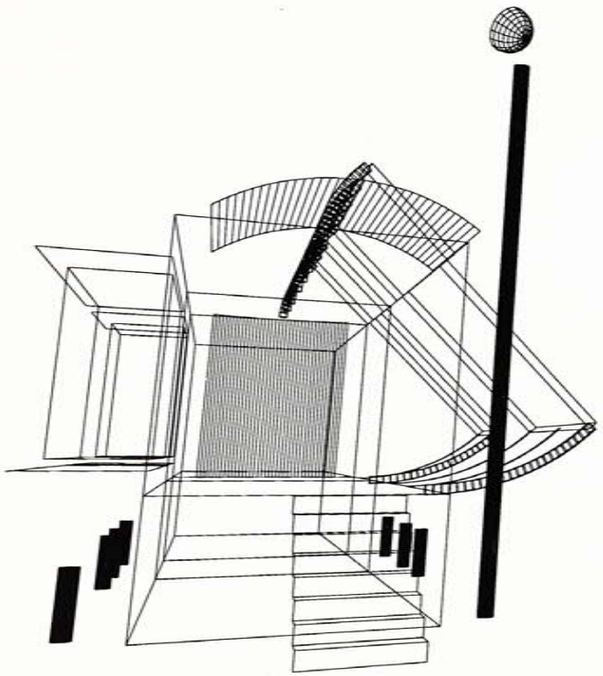


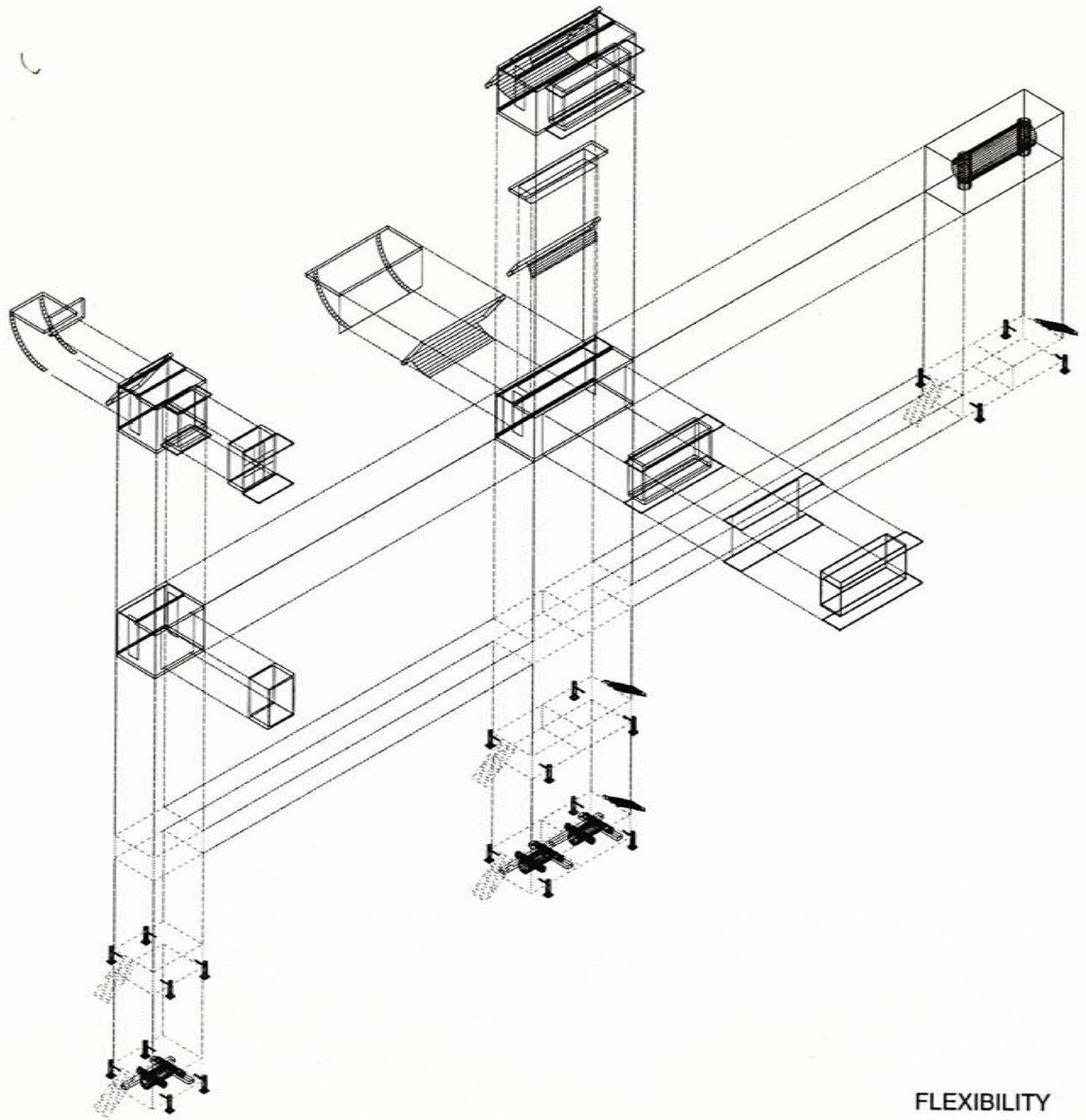


6.0 SCHEMATIC DESIGN

6.1 CONCEPT

The concept is to design a flexible unit which can perform different functions for broadcasting, exhibition and multi-media networking services

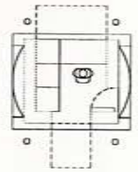




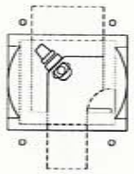
FLEXIBILITY

6.2 DESIGN OPTIONS

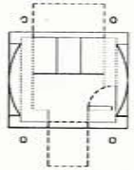
6.2.1 UNIT PLAN DESIGN



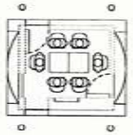
RADIO CONTROL ROOM

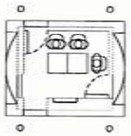


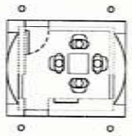
NETWORKING CONTROL ROOM

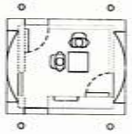


TELEVISION WALL

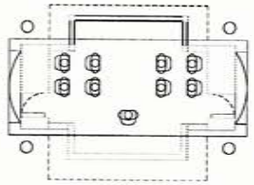


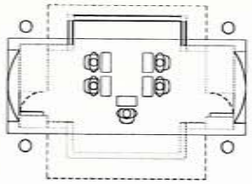


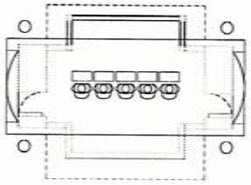


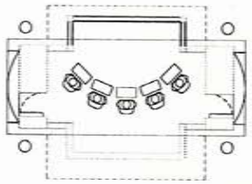


MULTI-FUNCTIONAL ROOM

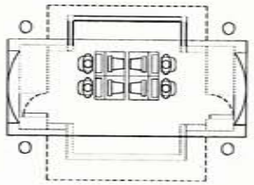


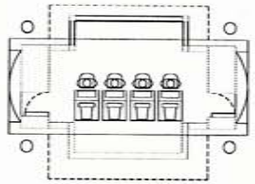


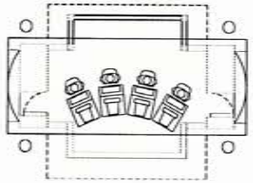


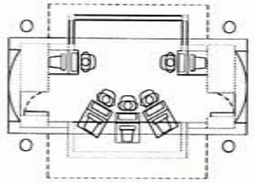


BROADCASTING STUDIO

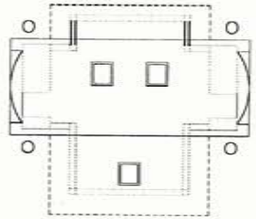


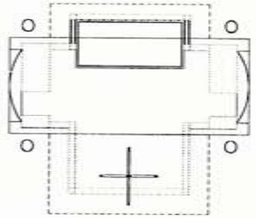


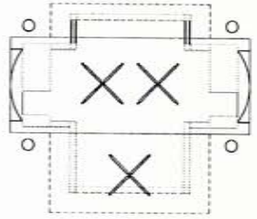




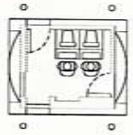
NETWORKING STATION



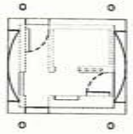




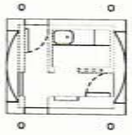
EXHIBITION STATION



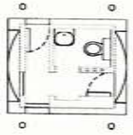
NETWORKING ROOM



CHANGING ROOM

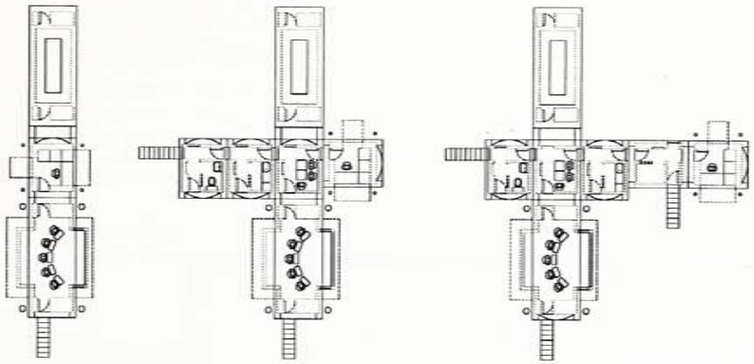


PANTRY

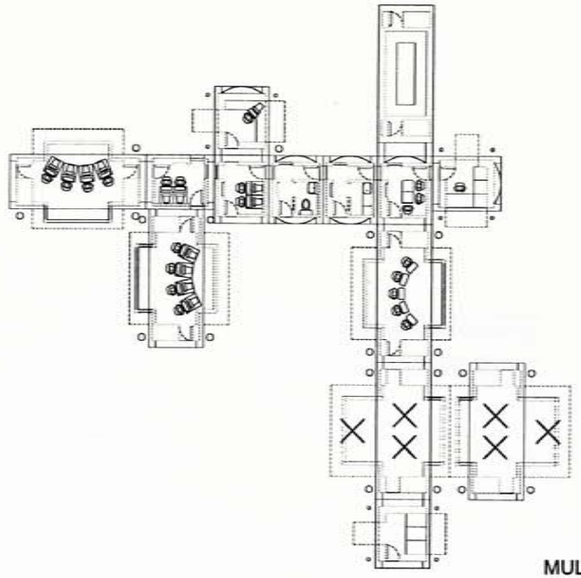


WASHROOM

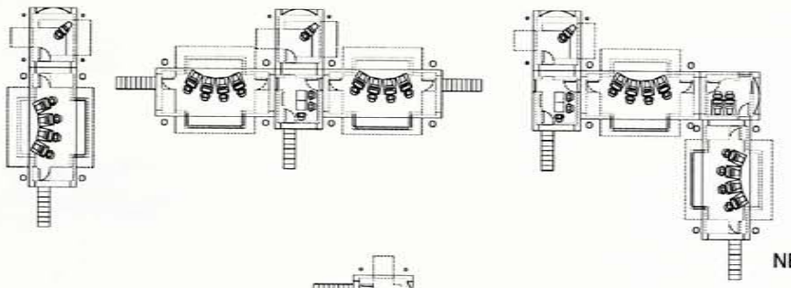
6.2.2 LAYOUT PLAN



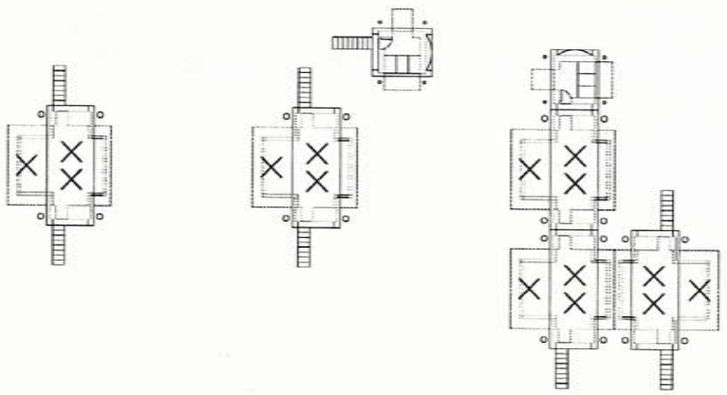
BROADCASTING STATION



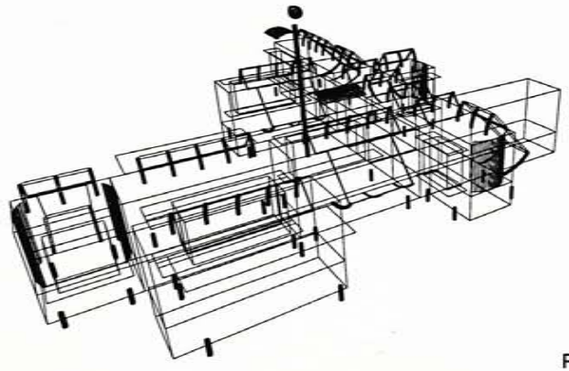
MULTI - MEDIA STATION



NETWORKING STATION

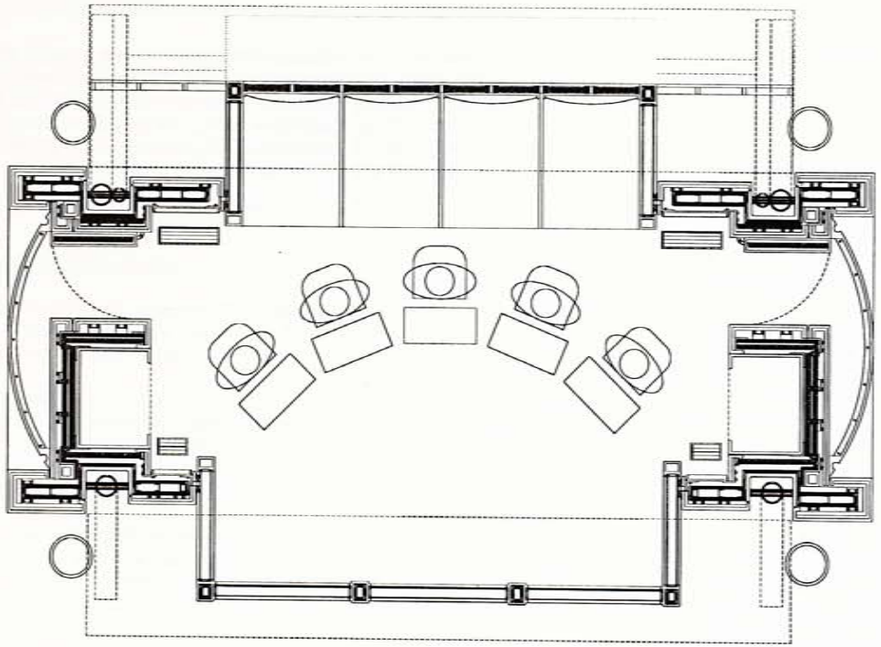


EXHIBITION STATION

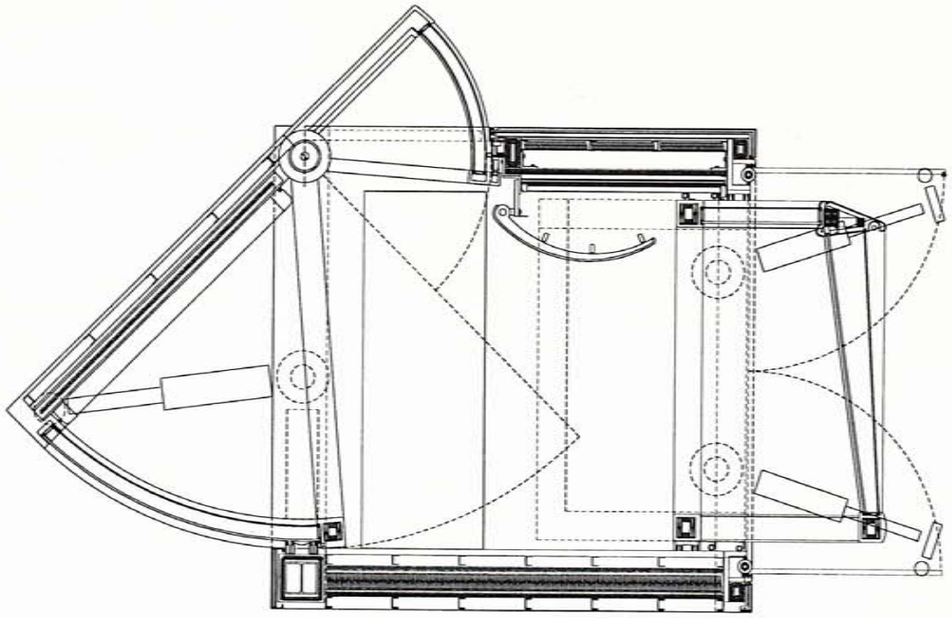


PERPECTIVE

6.3 DETAIL DESIGN



PLAN



SECTION

7.0 RESEARCH AND FIELD WORKS (I) ENERGY

7.1 PHOTOVOLTAIC ENGINEERING

Solar cells represent the fundamental power conversion unit of a photovoltaic system (PV system). They are made from semiconductors, and have much in common with other solid-state electronic devices. For practical operation, solar cells are usually assembles into modules.

The fundamental solar cell operation is based on the ability of semiconductors to convert sunlight into electricity by exploiting the photovoltaic effect. In the conversion process, the incident energy of light create mobile charged particles in the semiconductor which are then separated by the device structure and produce elctrical current.

Many different solar cells are now available on the market, and yet more are under development. The range of solar cells spans different materials and different structures in quest to extract maxmium power from the device while keeping the cost to a minimum. Devices with efficiency exceeding 30% have been demonstrated in the laboratory. The efficiency of commercial devices, however, is usually less than half this value.

7.1.1 TYPES OF SOLAR CELLS

Crystalline Silicon Cells

Crystalline Silicon Cells hold the largest part of the market. To reduce the cost, these cell are now often made from multicrystalline material, rather than from the more expansive single crystals.

The technology of crystalline silicon cell is well established. The modules have a long lifetime (20 years or more) and their best production efficiency is approaching 18%.

Amorphous Silicon Cells

Cheaper (but also less efficient) types of silicon cells, made in form of amorphous thin films, are used to power a variety of consumer products such as solar-powered watches and calculators. Larger amorphous silicon solar modules are also available.

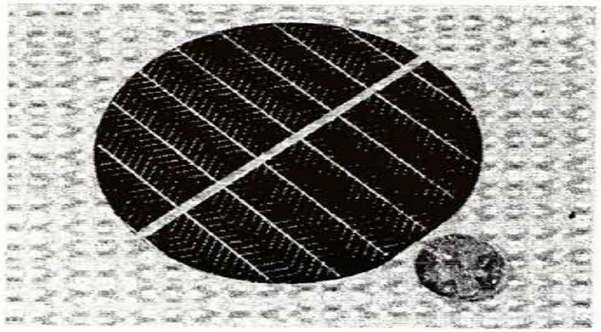
Compound Semiconductors

A variety of compound semiconductors can also be used to manufacture thin-film cells, for example, Cadmium Telluride ro Copper Indium Diselenide. These modules are now beginning to appear on the market and hold the promise of combining low cost with acceptable conversion efficiencies.

High-efficiency Solar Cells

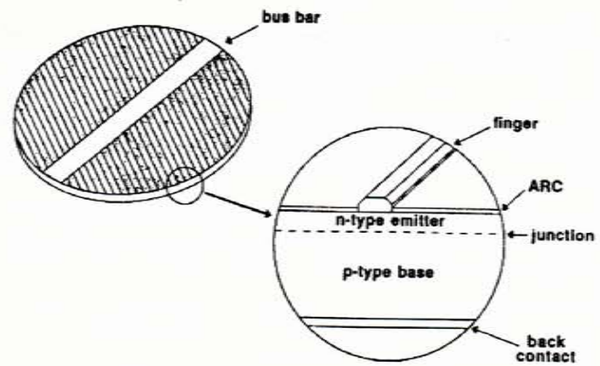
A particulat class of high-efficiency solar cells from single crystal silicon or compound semiconductors, such as Gallium Arsenide or Indium Phosphide, are used in specialised applications. Their applications include to power satellites or in systems which operate under high-intensity concentrated sunlight.

7.1.2 MECHANICS OF SOLAR CELLS



The solar cell is a semiconductor device that converts the quantum flux of photons into electric current. When light is absorbed, it first ceates electron-hole plairs. These mobile charges are then separated by the electic fields at the junction. The electrical output from the cell is described by the I-V charateristic whose parameters can be linked to the material properties of the semiconductor.

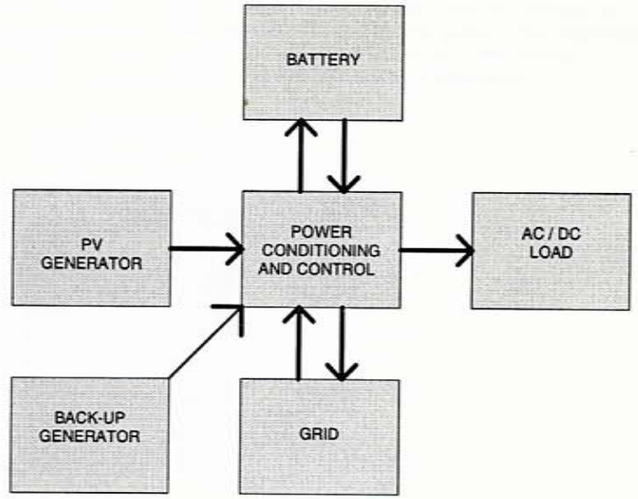
In a typical solar cell, the electrical current is extracted by contacts to the front and rear of the cell. The top contact structure which must allow light to pass through is made in the form of widely-spaced thin metal strips, which is udusily called Fingers, that supply current to a larger Bus Bar. The cell is covered with a thin layer of dielectric material - the Anti-Reflection Coating (ARC) - to minmise light reflection from the top surface.



7.2 STRUCTURE OF A PHOTOVOLTAIC SYSTEM

The photovoltaic system consists of a number of parts of subsystem:

1. The photovoltaic generator with mechanical support and, possibly, a sun tracking system.
2. Batteries or other storage subsystem.
3. Power conditioning and control equipment, including provision for measurement and monitoring.
4. Back-up generator.



BLOCK DIAGRAM OF A COMPLETE PHOTOVOLTAIC SYSTEM

7.2.1 THE PHOTOVOLTAIC GENERATOR

The heart of a photovoltaic system is the photovoltaic generator. It consists of photovoltaic modules which are interconnected to form a DC power-producing unit. The physical assemby of modules with supports is usually called an array.

A photovoltaic module represents the basic construction unit of a photovoltaic generator. The cells in a module are interconnected in series. A typical 4-inch diameter crystalline silicon solar cell, or a 10 cm x 10 cm multicrystalline cell, will provide between 1 and 1.5 watts under standard conditions, depending on the cell efficiency. This power is usually supplied at a voltage 0.5 to 0.6 V. Since there are very few appliances that work at this voltage, the immediate solution is to connect the solar cells in series.

The number of cells in a module is governed by the voltage of the module. The nominal operating voltage of the system usually has to be matched to the nomial operating voltage of the storage subsystem. Most of photovoltaic module manufacturers therefore have standard configurations which can work eith 12 volt batteries. Allowing for some overvoltage to charge the battery and to compensate for lower output under less-than-perfect conditions, it is found that a set of 33 to 36 solar cells in series usually ensures reliable operation.

The power os silicon modules thus falls between 40 and 60W. The module parameters are specified by the manufacturer uner the following standard conditions:

IRRADIANCE	1 KW/M^2
SPECIAL DISTRIBUTION	AM 1.5
CELL TEMPERATURE	25ºC

7.3 ENERGY STORAGE

Since solar energy supply is intrinsically variable in time, stand-alone photovoltaic sytems usually make a provision for energy storge.

The methods of energy storing can be summaried as the following table.

ENERGY	TECNOLOGY	REMARKS
MECHANICAL	PUMPED WATER	1. Common utility use as large-scale energy storge. 2. PV pumbing
	COM[PRESSED AIR	Demonstrated Technology for large-scale storage
	FLYWHEEL	Under investigation for small systems
ELECTRO-MAGNETIC	Electric current in Superconducting Ring	New development potential using 'high-temperature' superconducting materals
CHEMICAL	Batteriaes Hydrogen Production	Most common use

From a practical point of view, most stand-alone PV systems use battery storage. There are two types of battery storage, the primary and secondary battery storage. The seconary battery is by far the most common method of storing the electric energy generated by solar generator power system. The secondary cells, which are different from primary cells, are rechargeable. In a primary cell, however, chemical reaction is irreverisble and the consumed material cannot be regenerated. Therefore, secondary cell is ideal for solar generators.

A battery constructed of secondary cells can be discharged and charged a great many times. The actual conditions depends on the design, construction, use and care of the battery.

Cells and batteries are connected in series to increase the voltage that is to be made available. Cells and batteries are connected in parallel to increase the net current capacity.

Time is also a very important factor in this consideration. The evalulation cannot be only determined by the load but how long this current demand is to made. The ampre-hour factor is important in planning solar system.

The batteries in most common use are lead acid batteries because of their good availability and cost effectiveness. Nickel Cadmium batteries are used in some smaller applicatiions where their ruggedness, both mechanical and electrical, is considered essential. However their high cost per amount of enery has prevented their wider use in photovoltaics.

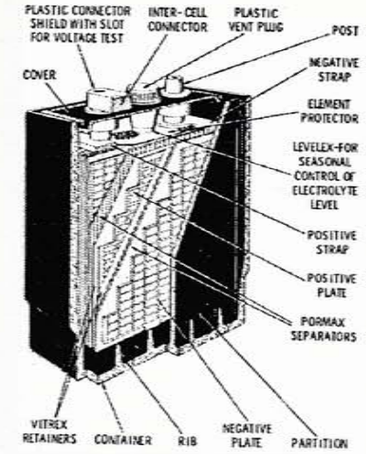
7.3.1 LEAD-ACID BATTERY

The lead-acid storage battery is presently the most common energy-storing device for solar power supplies. At low-power levels, the nickel-cadmium secondary battery is equally popular. The 6- and 12- volt auto storage battery is common. However, in higher-powered systems, better grade lead-acid types are used because of their longer life and ablilty to be charged and discharged.

The common storage battery is made of lead-acid secondary cells, each making available approximately 2.1 volts. A 6-volt storage battery has three such cells;a 12-volt battery has six. Each cell has a removable cap permitting cell testing and the addition of water, if required.

The small-sized lead-acid batteries can serve well in low-power solar-powered systems. Portable and other low-power radiocommunication installions can make use of these small batteries having average dimensions of 10cm x 12.5 cm x 15 cm. They can be ranging from 4-20 ampere-hours. Several small-battery models have ratings as high as 30 ampere-hours.

Each cell has a number of positive and negative plates made of lead peroxide and sponge lead, respectively. The electrolyte is a solution of and pure distilled water. The fully charged specifc gravity of the electrolyte is nominally 1.26. This figure refers to the weight of the electrolyte solution compare with that of an equal amount of pure water.



A typical Lead-acid battery

7.4 APPLICATION: SOLAR TELECOMMUNICATION

The Photovaltaic systems are fully justiable on the grounds of conventional economic arguments.

The essential units of the solar-powered radio station operated by W3FQJ are:

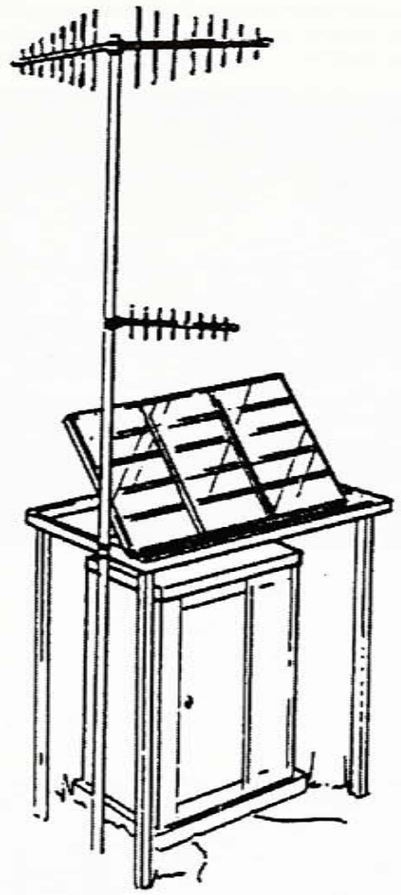
- Argonsut 5W transceiver
- charging panel
- 5.5-ampere-hour motorcycle battery of sizing 12.5cm x 6.75cm x 13.75cm each.
- 12V, 300-milli-ampere roof-mount spectrolab light-energy converter

When the solar panel is operating in optium sunlight, its output is 3.5 watts(12 x 0.3). At dawn and again at dusk, and dark , overcast days, the power leveel is significantly lower. Nevertheless, the installation makes available more than enough electrical energy for busy 5-watt station.

Twenty hours of accumulative operation at 300mA produces 6 ampere-hours (0.3 x 20). For small lead-acid batteries, this solar panel can be operated as a continuous float-voltage charger, or it can be operated whenever it is wished to recharge a battery. In charing even smaller batteries, a resistor can be added in series to prevent an excessive charge rate. Or the light converter can be used as a low-current trickle charger with the insertion of an appropriate resistor.

The size of the solat panel is approximately 3 x 39 inches. For this particular installation, the panel was mounted on a 5-foot section of television mast which was bracketed to the vent pipe on the roof. Flat aluminium stock was used to fashiion a homemade support to permit adjustment of the tilt angle of the panel. A U-bolt permits the top off the panel to be moved up and down the mast. At the bottom of the panel, a flat piece of aluminum with a series of holes permits easy accommmodation of practical tilt angles.

The recommended tilt for the panel corresponds approxiamately to the latitude of the site in degrees north or south of the equator. This particular sstation is reasonably near the 40° north latitude line. This figure refers to the angle of tilt away from the horizontal. The nearer the equator, the nearer the optimum mounting angle approaches a horizontal position.



A Solar Telecommunication Unit

8 RESEARCH & FIELD WORKS (II) STUDIO

8.1 TYPES OF STUDIOS

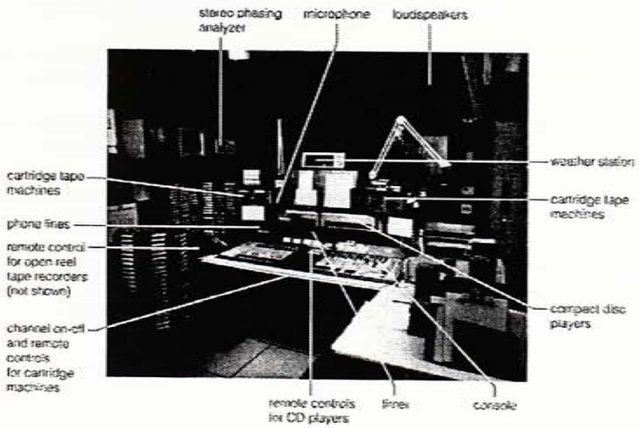
A sound studio is a room or group of rooms of rooms used for the performance, production and processign of sonic materials for broadcast, film or music recording. Generally, sound studios fall into three catergories: *performance, production* and *postproduction*. Some studios are relocatable. Remarkably, a *workstation* is not even a studio in the conventional sense: it is a self-contained unit that can be usedfor most production and postproduction operaions. It takes up comparatively little space and it does not require audioetape, videotape or film as the recording medium.

8.2 PERFORMANCE STUDIOS

A performance studio is where the talent performs. Studios vary in size from a small announce booth used by a single announcer to a large sound stage where productions are recorded.

'Combo' - Combination of Control room and Performance Studio

In radio a performance studio usually doubles as a Production Studio / Control Room; when it does not, talent worked from a studio next to the Control Room. A 'Combo' studio is usually used for the radio broadcasting in which it allows performer (Disc Jockey) controling and presenting the musical materials at the same time.

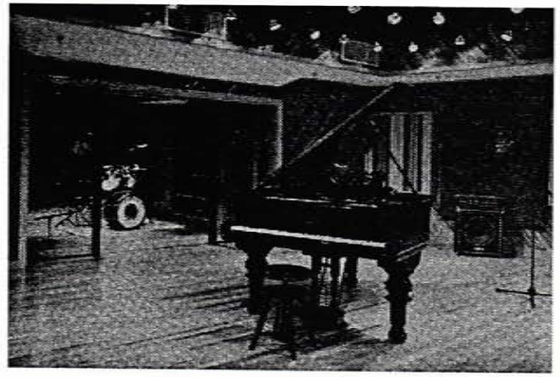


Radio talk / interview studio

A slightly larger studio is used for the Radio Talk and Interview purposes. The main differences between this type of studio with a 'Combo' is that a separated Control Room which next to the Studio is needed.

Music Recording Studio - Isolated Music Studios

In music recording, as in radio, Performance Studios and Control Rooms are contiguous, with a glass window between them. Performance Studios are likely to contain isolation booths for different musicans to prevent their sound from leading into microphones of other instruments. Decor and lighting are apt to be specially designed to provide a more comfortable atmosphere for hte musicians.



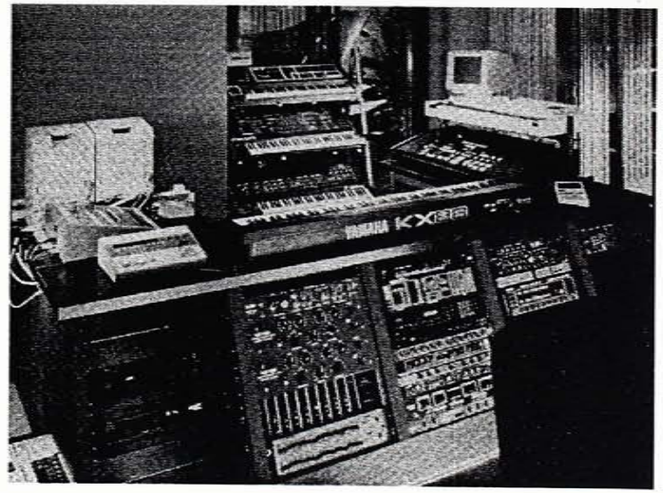
Electronic Music Studios

At one time synthesizers and the musicans who used them belonged to the difficult and esoteric domain of electric music. Most synthesizers were cumbersome and required considerable technical and sonic instruction to master. Moreover, these synthesizers could producer only *one* sound at a time.

Only by connecting and synchronizing two or more synthesizers could complex timbres be reproduced.

Today, synthesizers are available in ever increasing variety, from basic to complex. Thay have been simplified to the point where virtually anyone with an ear can use them - musical training is not a requiement. They have also been developed to such a sophisticated level that any number of them van be connected and synchronized to mimic any existing sound and create just about and other sound the mind can imagine. In conjuction with computers, the sonic possiblilties of synthesized sound are limitless. This development is called *Musical Instrument Digital Interface* (MIDI).

As a result, the use fo synthesizers has moved beyounf the world fo electronic music into most facets of audio in media. Entire studios now consist of electronic and computer-assisted instruments that meet virtually any sonic neeed in performing and producing music and sound effects.



8.3 PRODUCTION STUDIOS

Audio Production Studios house most of the equipment needed to prepare soundmaterials. They may be used exclusively for production or also serve as performance studios for radio disc jockgys, newscasters and talkshow hosts. The array and complexity fo equippment in production studios vary with their purpose, but certain basic equipment is found in most of them, including the following:

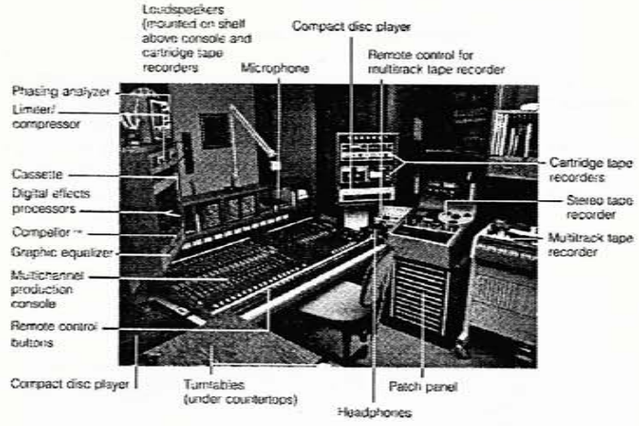
- Microphone - a familiar, almost ubiquitous piece of sound equipment.
- Compact Disc Player - a disc player that uses a laser beam to read information recorded on a compact disc (CD).
- Turntable - a sturdy record player specially designed for professional audio facilities. It has been supplanteed by the compacted disc player.
- Tape recorder - an analog or digital device that records and plays information stored in the form of magnetic energy. Most production studios have at least two types of recorders: the familiar open-reel machine, often including multitrack format, and the analog catridge tape recorder that uses a continuous tape loop enclosed in a plastic cartridge or digital casts that use Cds or computer disks. Analog cassette tape recorders are also available, although they are seldom used for production.
- Console - a device that takes all incoming audio signals from microphones, disc players, audiotapes and videotape recorders and other sound sources and amplifies, balances, mixes and routes them for recording or broadcasting .
- Signal Processors - devices that change come characteristeric of a sound, such as the equalizer and limiter - compressor.
- Loudspeaker - a device that makes electric signals audible by converting them into sound.
- Headphones - "miniature loudspeakers" that fit over the ears to provide provate listening and to isolate outside sound.
- Remote Control - a device to automtically start, stop and cue equipment.
- Patch panel - an assembly of wired connections linking the inputs and output of the audio components in a studio, which facilitates the rounting and rerounting of signals.

Radio

Radio control rooms are usually designed so that the equipment, with or wirhout remote control, is within arm's reach of the operator. In control rooms used for on-air broadcasting, the operatro is generally the performer as well.

Radio stations also have off-air contol rooms for recording and editing commericals, jingles, announcements, news, stories, and other program materials. These production studios, or production control rooms, house basically the same type of equipment as on air control rooms only more of it, including additional signal processors such as the Harmonizer, time compressor and digital delay.

Systems in Radio Production Control Room



Music Recording

Control Rooms used for music recording contian bery large consoles, with many input and output, capable of handling several sound sources at once. Open-reel tape reocrders (analog or digital, or both), are in two-track and various multitrack formats: sereval different types of signal processors are available; and two, three, or four sets of loudspeakers are used to compare how a tape sounds on different reproducign systems.

Special lighting is often part of the design of a recording control room and studio. Its function is not only to illuminate but also to create a mood conducive to musical performance.

Control room used for music recording

8.4 POSTPRODUCTION STUDIOS

Postproduction is when the raw materials recorded during production are assembled, through editing and mixing, into a finished tape or film. The practice is not new; postporduction has almost always been a part of the process of producing film because film sound can only be edited and mixed after production is completed. Advances in digital technology, tape coding, tape recorder synchronization, synthesizers, computer interfacing and information storage have helped to develop postproduction into a major stage in the production process and have led to the establishment of the postproduction editing suite and the workstation, also known as tapeless studio.

Editing Suite

The postproduction editing suite is a room or group of rooms in which previously taped sound or picture, or both, are edited and assembled. The quantity and capabilty of the equipmentin an editing suite usually depends on how the suite is used; editing feature materials requires more technical support, for examples, than does news.

Generally, however, even in modest editing suites it is possible, by touching a few buttons, to arrange and rearrange sound and pictures from tape or hard disk, or both, at once; add and mix sound effects and music from audiotape or disk recorders (often multitrack); preview, for comparison, various editing approaches to a particularsequence in any order; and store, in a computer memory, every cuw for the record and for recall at any time.

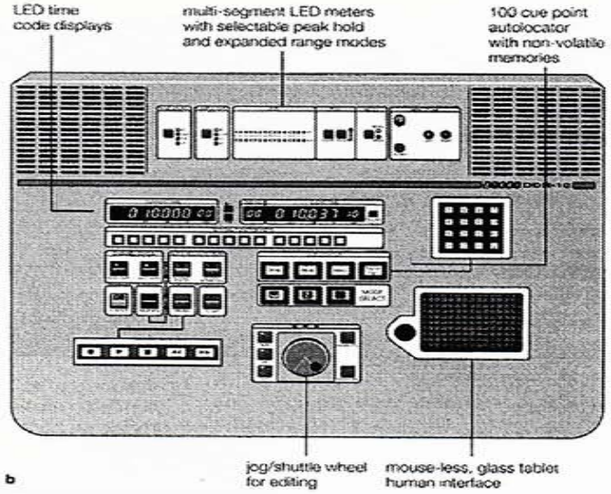
Transportable, self-contained, hard-disk audio workstation for recording, editing and signal processing

Workstations

Several types of equipment in different locations are often needed when a postproduction editing suite is used to create a finished product. The digital audio workstation, by comparsion, can do most everything at a contral location. A digital audio workstation is a computer-controlled system or networked collection of devices that allows digital audio recording, processing, editing, mixing and relay functions to be controlled from a central location. Most audio workstations have a central computer with integrated, multifunction hardware and software that allow general-purpose computing, signal processing, real-time synthesis and interaction, and random access retrieval. They also contain various input and output devices and sizaavle information storage capacity. What all this high-tech equipment means is that the audio it once took many people in various studios to create, produce, edit, and mix can now be turned out, to the specific requirements of TV, film, music recording, or radio, by onw or few individuals at a single workstation.

Basic workstations are hard-disk recorders and editors that usually handle mono or stereo audio. The next level facilitates multitrack recording and mixing, usually controlled through a 'virtual' console representation on the monitor screen. With increased capability, a digital audio workstation can perform moew complex mixing wirh additional tracks and *Digital Signal Processing* (DSP) - such as equalization, limiting - cmpression, and reverberation. A 'hard' mixing console, putting traditional console contrls in the user's hands, is often a component of an upscale audio workstation.

Details of Control panel of Workstation



b

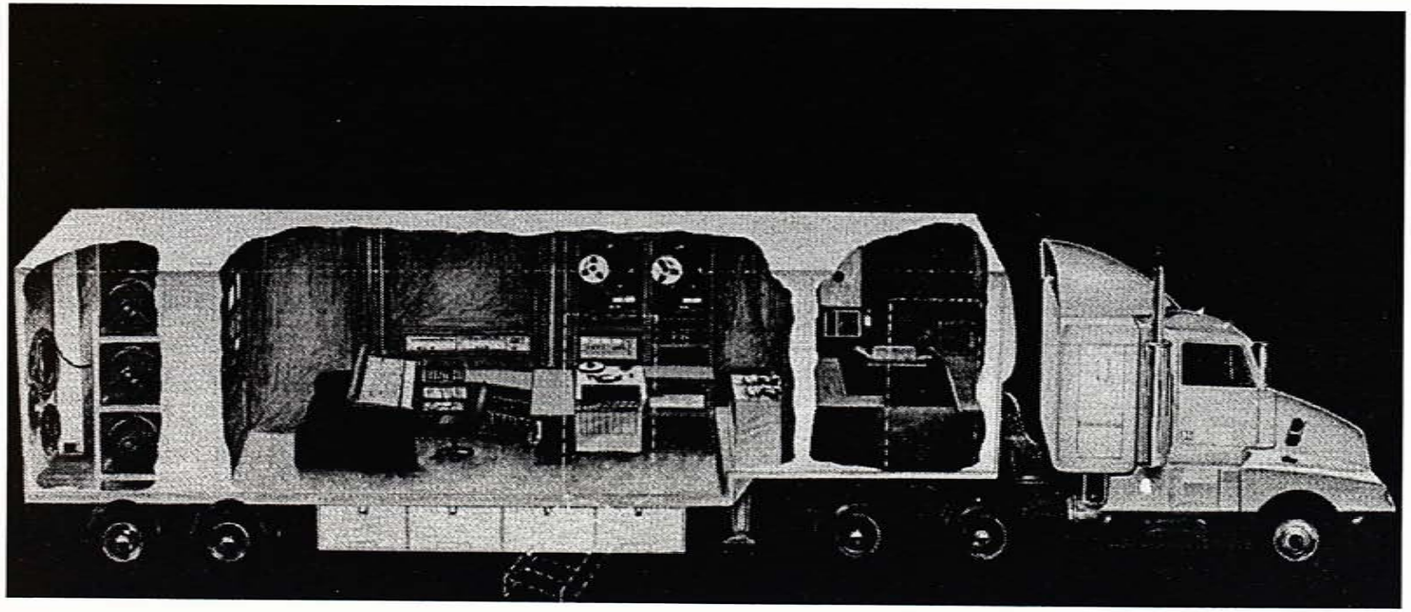
Master Control

Broadcast staions have another control area - Master Control. Signals from the control rooms are fed to master control for final adjusting and processing before they are sent on to broadcast or sometimes, recording. Master Control is usually a separate room with hghly technical equipment equipment operated by specially trained engineers and technicans. In small stations part of the main on-air production studio may be used to house the master control equipment.

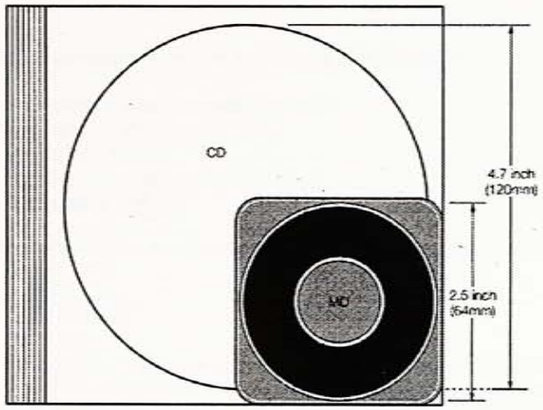
8.5 MOBILE STUDIOS

Much production occurs on location, away from permanent studios. To faciltate production at a location site, specially designed moblile units have been outfitted with the same type of equipment used in studios.These compact studios range in size from small vans, used to produce spot news reports, disc jockey programs, and commercials, to tractor trailer trucks, used for sports events, music concerts and specials.

This is getting more common nowadays broadcasting activities take place in the mobile production units. Because of the advanced technologies, programs produced in the mobile broadcasting unit can be as good quality as in a fixed-location studio.

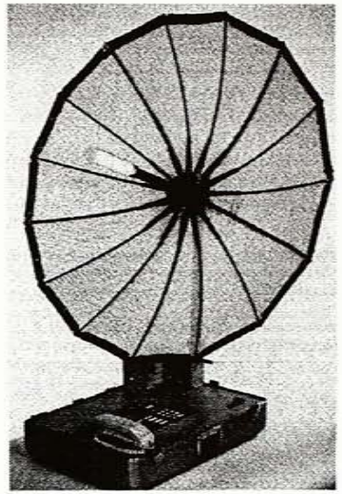


8.6 PORTABLE EQUIPMENT



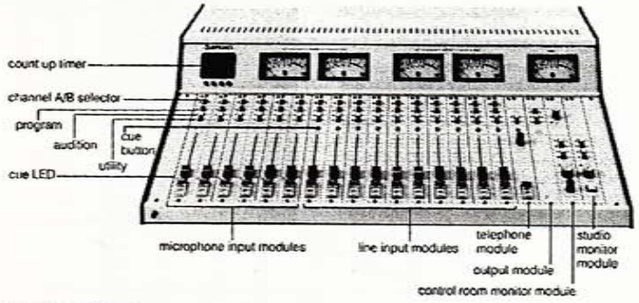
Size of MD and CD

Portable Antenna and Transmitter



Portable Antenna

Portable MD Player



Audio Control Panel

8.7 STUDIO DESIGN

The major factors in design a studio are as followings:

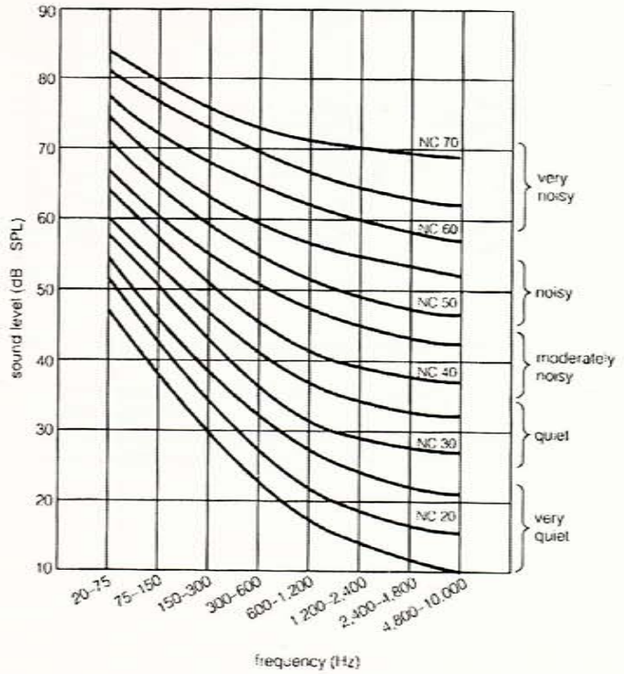
- isolation of sound outside and inside
- dimension of the studio
- shape of studio
- construction materials in the studio
- acoustical features

These five factors are directly related to on e overriding concern: NOISE.

8.7.1 NOISE

To quatitify the 'loudness' or amptude of noise, acousticians developed Noise critica (NC) that identify, by means of a rating system, background noise - also called ambient noise - levels. This is emphasized that noise is part of our existence and can never be completely eliminated. Audio equipment also generates system noise and recording tapes generates tape noise, etc. NC levels is only set for the target to achieve.

Noise Criteria (NC) Curves



Recommended Noise Criteria (NC) levels for selected rooms

TYPE OF ROOM	RECOMMENDED NC CURVE	dB
Broadcasting Studio	NC 15 - 25	25 - 35
Recording Studio	NC 15 - 25	25 - 35
Concert Hall	NC 20	30
Drama Theaters	NC 20 - 25	30 -35
Motion Picture Theater	NC 30	40
Sport Coliseum	NC 50	60

8.7.2 ISOLATION

Sound studiomust be isolated to prevent outside noise from leaking into the room and to keep loud sound levels generated inside the room from disturbing neighbors. This is accomplished in two ways

1. by dettermining the loudest outside sound level against the minimum acceptable NC level inside the studio
2. by determining the loudest sound level indside the studio against a maxmium acceptable noise floor outside the studio.

The amount of sound reduction provided by a barrier - wall, floor, or ceiling - is referred to as *transmission loss* (TL). Because TL workd both ways, determining barrier requirements is equally applicable to sound traveling from inside to outside, and vice vesa.

Just as it is convenient to define a noise spectrum by a single NC number, so it is useful to measure a barrier on the basis of its transmission loss. Such a measurement is called *Sound Transmission Class*. Sound Transmission Classes vary with the type and mass of materials in barrier.

TYPE & MASS OF MATERIALS	STC LEVELS
4-inch Concrete Block	STC 48
8-inch Concrete Block	STC 52

8.7.3 DIMENSIONS

Sometimes a room's dimensions accentuate noise by renforcing certain frequencies, thereby altering, or 'coloring,' the natural sound. This may also increase reverb time. Such coloration also affects perception of tonal balance, clarity, and imaging. Recordings mixed in a control room with these problems will sound markedly different when played in another room. Other factors, related to shape of and construction materials used in a studio may also affect coloration.

Rooms have particular resonances at which sound will be naturally sustained. These are related to the room's dimensions. Resonance results when a vibrating body with the same natural frequencies as another body causes it to vibrate synpathetically and increases the amplitude of both of them at those frequencies if the vibrations are in acoustic phase.

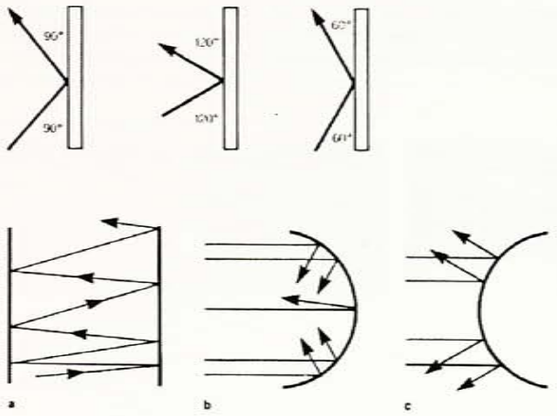
In a room, resonances occur at frequencies whose wavelengths are the same as or a multiple of one of the room's dimensions. To avoid additive resonances, room dimensions should not be the same, nor be integer multiples of one another.

Resonance is not always bad, however. The tubing in wind and brass instruments, the pipes in an organ, and the human mouth, nose, chaest, and throat are resonators. Air columns passing through them excite resonant frequencies, creating sound. Without resonators such as the box of a guitar or violin, weak sound sources would generate little sound. Some studios use this princple to construct resonators that help amplify certain frequencies to enhance the type of sound being produced. Also resonators can be used to absorb sound.

8.7.4 SHAPE

Acoutics is a a sicence of interacting relationships. Although a studio may have preferred dimensions, it shape is also important to good noise reduction.

Except for bass frequencies, sound behaves like light; its angle of incidence is equal to its angle of reflectance. If a studio has parallel walls, sound waves reflect into one another, creating standing waves. If there are concave surfaces, they serve as collecting points, generating unwanted concentrations of sound. A studio should be designed to break up paths of sound waves. Thsi is called Diffusion - uniform distribution of sound energy in a room so that its intensity throughtout the room is approximately equal. To break up the sound waves, various types of diffusers, which scatter sound waves, are used.



Shape of a room' surface affecting direction of sound reflection

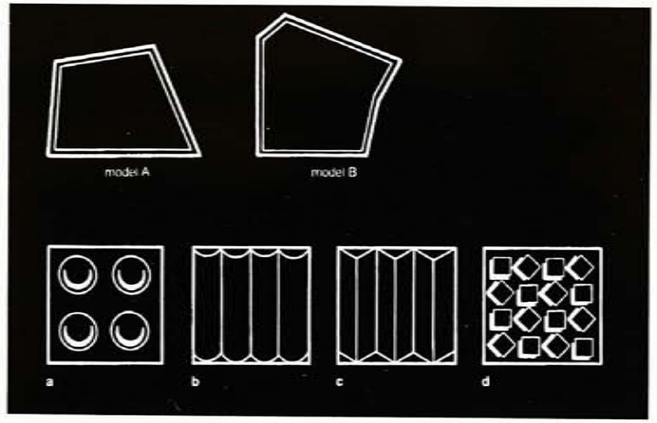
a) Two parallel surfaces opposite each other generate standing waves by reinforcingsound
b) Concave surfaces concentrate sound waves by converging them
c) A convex surface is more suitable because it disperses sound waves

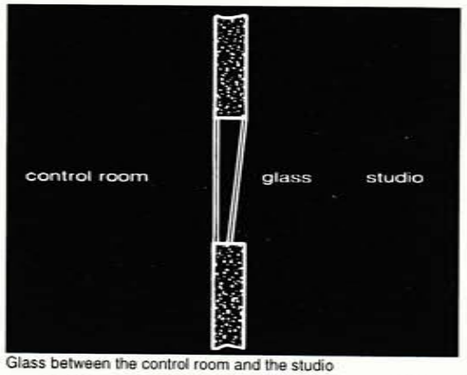
NONPARALLEL PLANE SURFACES

Typical studio designs have adjacent walls at angles other 90 degrees and different-shaped wall surfaces to help disperse the sound waves.

SURFACE TREATMENT

The typical studio wall surface shapes treatment are:
a) spherical
b) cylindrical
c) serrated
d) combination of square and diamond





Glass between the control room and the studio
- The glass is angled down toward the floor for sound dispersal and to avoid studio light reflections

8.7.5 CONSTRUCTION MATERIALS

When sound hits a surface, one of three things happens, depending on the surface's material and mass. Sound is reflected, absorbed, or partially absorbed and partially reflected.

The amount of indirect sound energy absorbed is given an acoustical rating called a *Sound Absorption Coefficient*. Theoretically, on a scale from 1.0 to 0.0, material with a sound absorption coefficient of 1.0 completely absorps sound, while material with a sound absorption coefficient of 0.0 is completely sound reflectant.

SOUND ABSORPTION COEFFICIENTS

Material	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
3/4-in. mineral fiber acoustical tile						
• hard backing	0.03	0.27	0.83	0.99	0.82	0.71
• suspended	0.68	0.67	0.65	0.84	0.87	0.74
1- in. figerglass tile						
• hard backing	0.06	0.25	0.68	0.97	0.99	0.91
• suspended	0.69	0.95	0.74	0.98	0.99	0.99
Brick						
• unglazed	0.03	0.03	0.03	0.04	0.05	0.07
• painted	0.01	0.01	0.02	0.02	0.02	0.03
Carpet, heavy						
• on concrete	0.02	0.06	0.14	0.37	0.60	0.65
• on foam pad	0.08	0.24	0.57	0.69	0.71	0.73
Concrete Block						
• coarse, unpainted	0.36	0.44	0.31	0.29	0.39	0.25
• painted, sealed	0.10	0.05	0.06	0.07	0.09	0.08
Fabric						
• 10 oz. medium velour hung flat to wall	0.03	0.04	0.11	0.17	0.24	0.35
• 14 oz. medium velour draped to half area	0.07	0.31	0.49	0.75	0.70	0.60
• 18 oz. Heavy velour draped to half area	0.14	0.35	0.55	0.72	0.70	0.65
Floor Materials						
• concrete or terrazzo	0.01	0.01	0.01	0.02	0.02	0.02
• tile on concrete	0.02	0.03	0.03	0.03	0.03	0.02
• wood parquet on concrete	0.04	0.04	0.07	0.06	0.06	0.07
• wood on wood joists	0.15	0.11	0.10	0.07	0.06	0.07
Glass						
• std window glass	0.35	0.25	0.18	0.12	0.07	0.04
• heavy plate glass	0.18	0.06	0.04	0.03	0.02	0.02
Gypsum wall board						
• nailed to 2 x 4 studs	0.29	0.10	0.05	0.04	0.07	0.09
Plaster						
• smooth, on brick	0.01	0.02	0.02	0.03	0.04	0.05
• rough, on lath	0.14	0.10	0.06	0.05	0.04	0.03
• 3/4-in. plywood paneling	0.28	0.22	0.17	0.09	0.10	0.11
Water surface, as in a swimming pool	0.008	0.008	0.013	0.015	0.020	0.025
Audience, seated in upholstered seats	0.60	0.74	0.88	0.96	0.93	0.85
• unoccupied cloth-covered seats	0.49	0.66	0.80	0.88	0.82	0.70
• unoccupied leather-covered seats	0.44	0.54	0.60	0.62	0.58	0.50
Chairs, metal or wood, occupied	0.15	0.19	0.22	0.39	0.38	0.30
People						
• adult				4.2		
• youth				3.8		
• child				2.8		

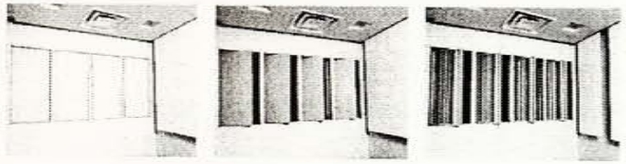
8.7.6 ACOUSTIC FEATURES

Theoretically, a studio design is to fulfill one specific sonic purpose, which is inappriate for another. In fact, to be more functional, many studios are designed with variable acoustics. They have movable panels, louvers, walls, or gobos to alter diffusion, absorption, and reverb time.

Purpose also addects design differences between studios and control rooms. Studios are designed for sound that is appropriate for microphone pickup, whereas control rooms are designed for listening to loudspeckers. Therefore, it is important that the diffusion - absorption proportions in a control room facilitate accurate assessment of the loudspeaker sound at particular locations in the room.

There are several different approaches to control room design. One solution is the *Live-end - Dead-end* (LEDE) concept. LEDE is the trademark of Synergetic Audio Concepts in which the front of the control room is sound absordent, while the rear of the control room reflects sound, directing it toward the operator's position. This design helps maintain a diffuse sound field. As the refected sound continues past the operator toward the front of the room, it is absorbed by the dead end of the room. This adsortion helps to minimize unwanted build-up of room reflections that would otherwise color the sound.

Variable acoustic built into a wall



a b c

a) a reflecting fface
b) an absorbing face
c) a diffusing face

Live-end part of the control room

Dead-end part of the control room

8.8 ERGONOMICS

Ergonomics is simply defined as designing an engineering system with the human element in mind. Sound is obviously the most important factor in studio design, but human neds should not be ignored.

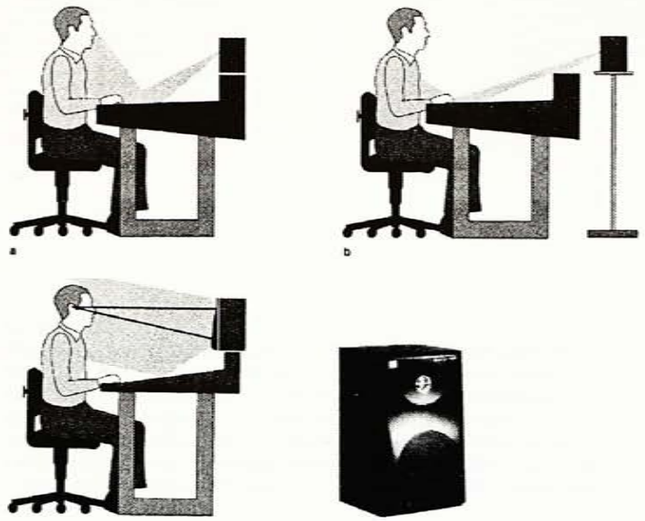
Light
Lighting is not only for lumination purposes. Careful lighting design can help to create a mood or atmosphere for the performers

Size
Ample room for peresonnel and equipment should prevernt a cramped, clasutrophobic feeling.

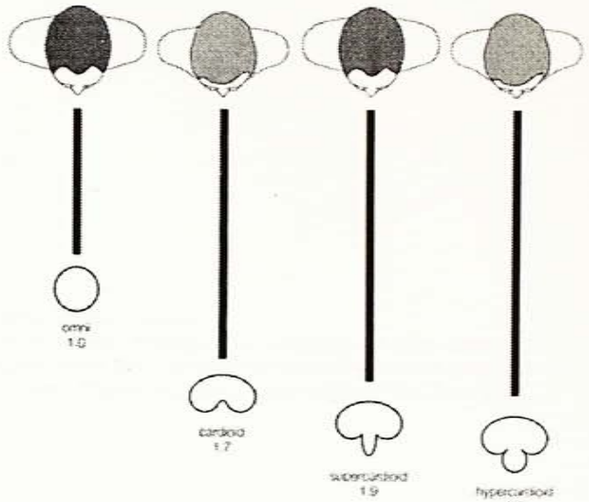
Position of equipment
Equipment and remote controls should be situated within arm's reach, and easy access should be provided to equipment that cannot be so positioned. The operator should be located at the point where hearing and seeing are optimal.

Furniture
Chairs should be comfortabel and should move around easily on wheels without squeaking. Other furniture should be functional, rather thanjust decorative, and reflect as little sound as possible.

Floor Covering
Rugs should be static-free and permit anything on wheels to move about easily.



Near-field Monitoring
a) if a meter bridge is too low, early reflections will bounce off the console degradig the overall monitor sound reaching the operator's ears
b) One way to minimize this problemis to place the near-field monitors a foot or so in back of the console andcover the meter bridgewiht absorptive material.
c) The curved design of this near-field monitor was intednd, among other things, to direct the shorter wavelengths aways form the listening postion



Different in relative working distance not only affecting the performance results, but the performers' feeling

9.0 CASE STUDIES

9.1 STUDIO CASE STUDIES

This study is to find out the technical standard of a broadcasting studio and the TV production and edition studios. The studios of Department of Journalism and Communication are selected for the purposes of studying.

Broadcasting Studio

Audio Studio
The Audio Studio is for the purpose of broadcasting production which occupying about a volume of 5m x 4m x 3m. Equipment is including speakers, microphones and intercom sets.

Control Room
The control room associated with the studio has a visual panel in front of that. The room is about same size as the studio. However, this is noted that this room is over-design for the purposes of demonstration. The equipment in this room is consisted of a control panel, two dubbing/editing units, three CD players, one acoustic effect mixer, three cassette players, two recording units and four equalizers. Due to the unsatisfactory physical condition control, a dehumidifier is employed in this room.

Other related facilities
Sound Effect & Editing Unit is consisted of a mixer, control unit, cassette player and a set of computer unit including monitor, hard-disc and input devices. The working environment is about 1m x 2.m x 2m

Audio Studio

Control Room of Audio Studio

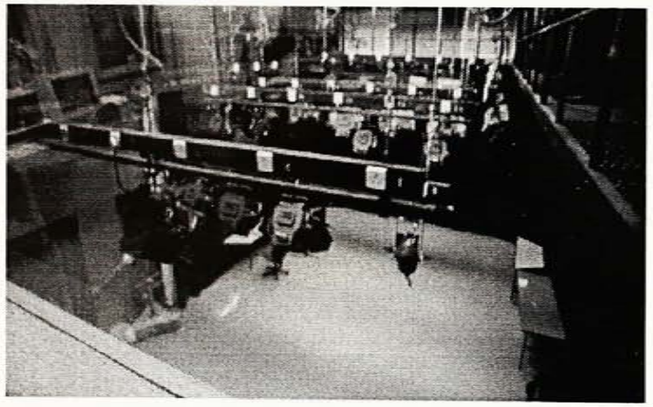
Sound Effect and Editing Unit

Television Studio

Production Studio
The production studio is about 10m x10m x10m. It has three layers of background curtain with the color of blue, black and white. The upper part of the studio is for the lighting system and air-conditioning systems. The top part of the studio is very dark in color. Equipment included three sets of cameras, intercoms, microphones and one TV monitor.

Master Control Room
This room is to monitor the TV program production. There are fourteen monitors, one master VTR control panel, one lighting system control panel with a computer monitor, one special effect & editing unit with a monitor, power units, three VTR tape players, controllers and two computer sets for subscription display.

Audio Control Room
This room is next to the master control room and with visual panel to Master Control Room as well as the Production Studio. This room is about 2m x 6m x 3m. There are an audio control panel, speakers, intercom, two monitors, tape players, controller tower and special acoustic effect computer set.



Television Studio

Master Control Room

Audio Control Room

9.2 RELOCATABLE ARHITECTURE CASE STUDIES

The case study in this chapter is for the purposes of understanding the function and the mechanics of mobile or temporary architecture in the world.

9.2.1 UNESCO NEIGHBORHOOD WORKSHOP

UNESCO Neighborhood Workshop is one of the important projects in the evolution of strategies for rehabilitating historic urban fabric. It is particularly significant for the way it proposed using the most up-to-date technology to empower a traditional community and its craftsmen to repair their ancient town.

This research was commissioned to find a strategy that would save not just isolated historic monuments but while historic centers with their vital communal ties and traditions. Urban redevelopment, a panacea of the previous decade, had been immensely destructive of what now recognized as precious historic fabric, as well as of the social fabric.

Construction

The Neighborhood Workshop was a 2.4 meter cube brought in by truck and set up in a piazza. There its four sides were unfolded below a sheltering tent roof, revealing their contents and defining a series of spaces for a wide range of activities open to and inviting the curiosity and participation of local citizens. Each side was dedicated to a different facet for the reconstruction process.

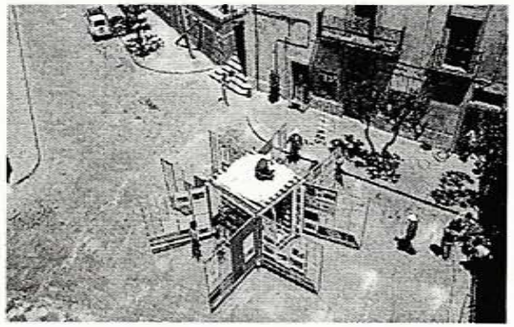
The first contained some of the most sophisticated equipment available for quickly and easily surveying the exact condition of the physical fabric of the town. But besides such advanced forms of survey as photogrammetry and thermography, others were cunningly improvised, such as the rudimentary aerial photography achieved with an ordinary motor-driven camera, which was held aloft by balloon and walked around the town.

The second side was where proposals were formulated and their feasibility tested, and where community and craftsmen where inculcated in new ways of doing things. Here the primary resource was not equipment but expert advisers.

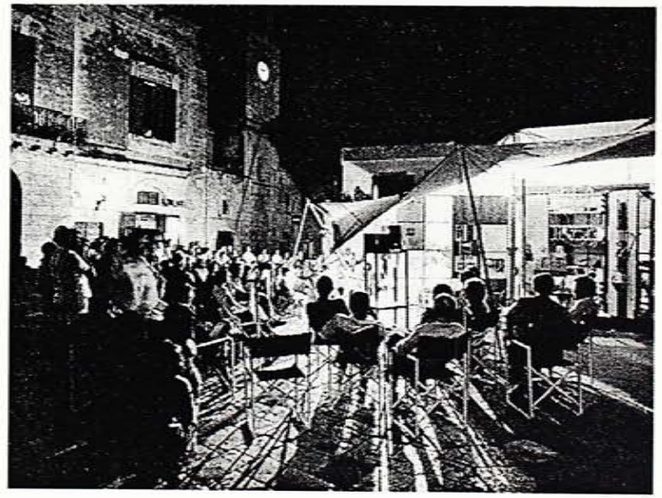
The third side was for documentation and discussion and the fourth was devoted to actual construction. Included in this fourth side were many ingenious tools that could be easily manipulated and mastered by local artisans and that could be used in constrained contexts.

Transportation

The transportation of building materials was by battery- was by battery-powered tractor driven by someone walking beside it, its low-pressure tyres allowing it even to scramble up staircases. Simple electric hoists lifted materials and movable parapet-attached cradles eliminated the need for scaffolding in very narrow streets.



Setting up



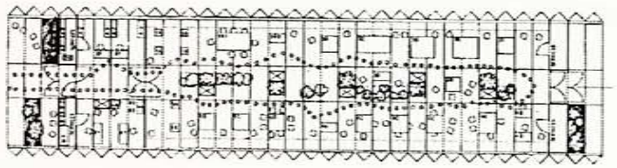
Exhibition and Performance

9.2.2 IBM TRAVELLING PAVILION

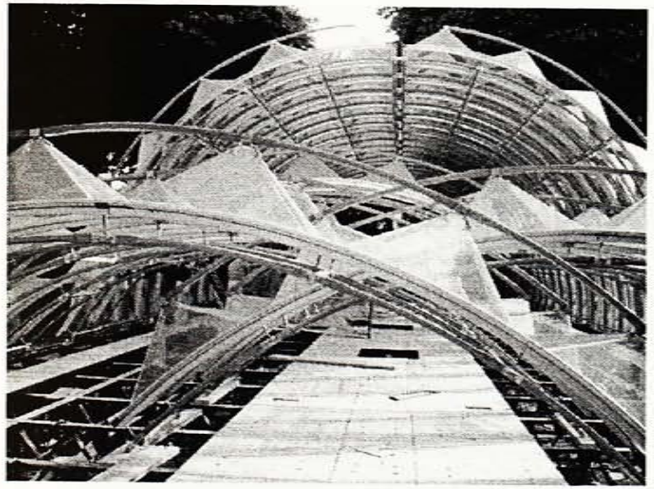
This pavilion is a transparent vault, 48 meters long by 12 meters wide and 6 meters high, made up of 68 half arches (forming 34 three pin arches) each consisting of six polycarbonate pyramids held together by laminated timber struts with cast aluminum joints. The half arches are in fact three-dimensional trusses, with the polycarbonate serving as both the cladding membrane and the structural web between inner and outer chords.

The original design was to be of complete arches with slot-together joints in which the aluminum ends of each strut fitted into cut-outs in an aluminum disc. Although this solution was conceptually as elegant as the individual joints, which would otherwise have been too distractingly dominant, this would have resulted in modules that were not easily dismantled and transported.

The complete arch was too large to move, individual pyramids too labor intensive. For these and other structural reasons, the half arch was chosen, resulting in a large unit that could be quickly disassembled and yet easily manipulated by a couple of workmen.



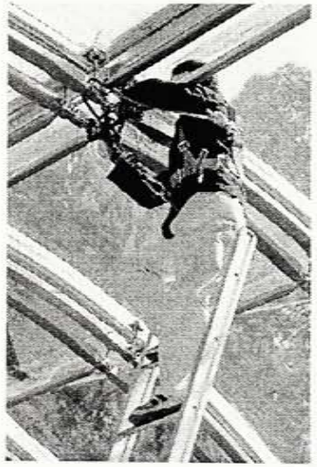
Plan

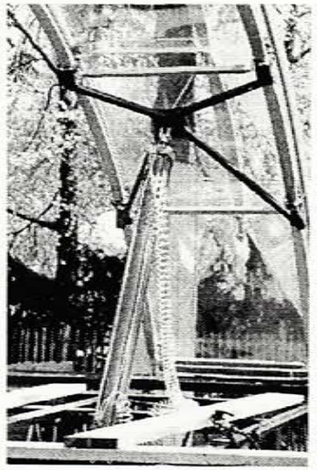


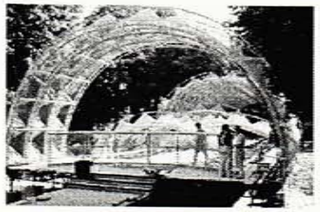
Technology

The exacting placing of opaque pyramidal elements, which were fixed inside the transparent ones, and of mesh screens is determined by a process of computer simulation of light and thermal conditions of the targeted environment.

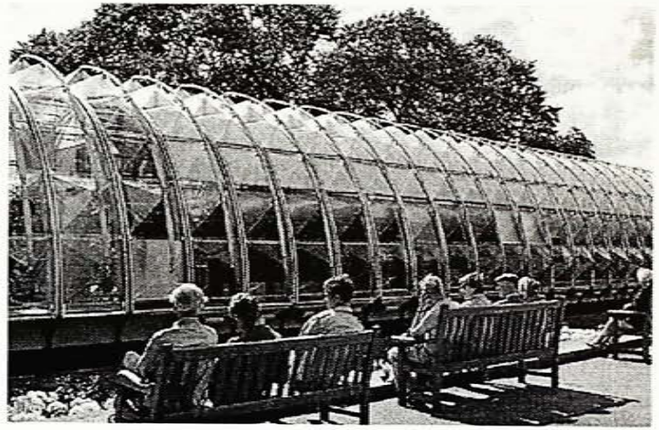
Together these controlled glare and heat loads. During cold spells, condensation on the pyramids was prevented by blowing warm air onto them from nozzles identical to those used on aircraft and set into small ducts that branched from either side of a large duct that ran the length of the pavilion, suspended from the central pins of the arches. Other air-conditioning ducts and cabling were accommodated within the structural depth of the floor that was raised and leveled on jacks.







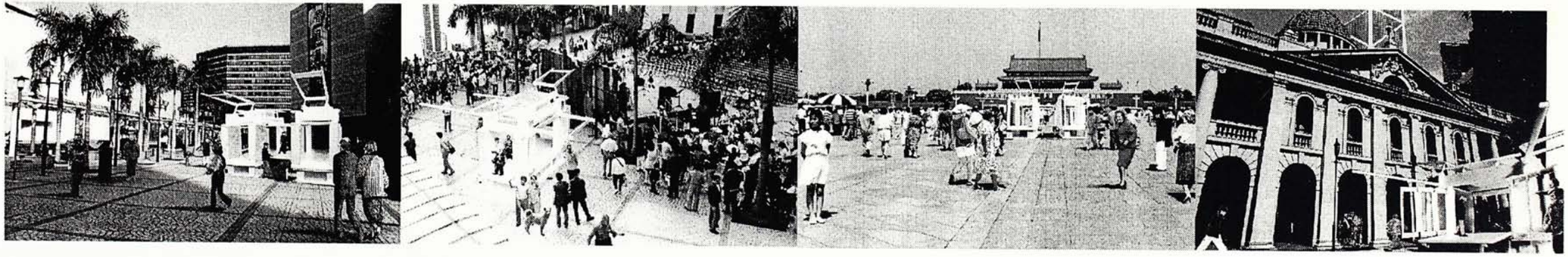
Assembly of Structural Menbers

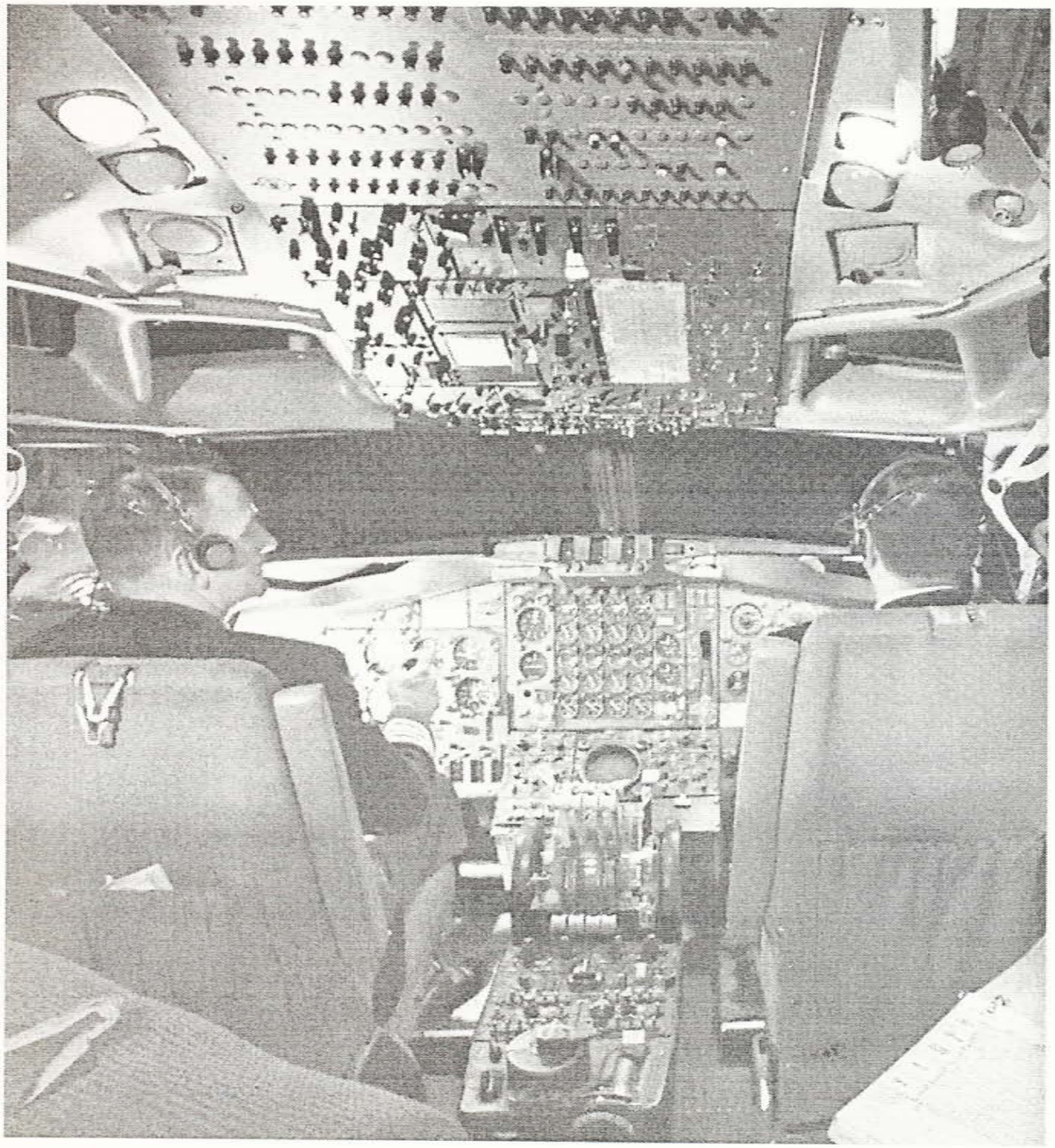


Exterior

Interior

ON AIR





THE CHINESE UNIVERSITY OF HONG KONG
DEPARTMENT OF ARCHITECTURE

96 97 MASTER THESIS

ON AIR

RELOCATABLE MULTI -MEDIA STATION FOR RTHK

DESIGN REPORT

LO KONG ALVIN

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9.1 PROGRAMMING REPORT

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Prof Paul Lee	Professor, Department of Journalism and Communication, CUHK	
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Miss Emily Ng	Administrative secretary, Administrative Unit, Radio Television Hong Kong	
Mr Simon Hun	Senior Mobile Production Engineer, Radio Television Hong Kong	
Mr Lee Wing Kei	Senior Telecommunication Engineer, Radio Television Hong Kong	
Miss Sicilla Lam	Library Manager, Radio Television Hong Kong	
Miss Lam	Public Relation, Radio Television Hong Kong	
Miss Hui	Public Relation, Radio Television Hong Kong	
Dr Raymond Yau	Senior Building Services Engineer, Ove Arup Groups	
Dr Sam Tsoi	Senior Acoustic Engineer, Ove Arup Groups	
Mr Stephen	Senior Architect, Dennis Lau and Ng Chun Man Architect Ltd	

1.0 BACKGROUND

1.1 CLIENT

Radio Television Hong Kong (RTHK) is an independent institution and funded by the government. It is charged with providing balanced and objective broadcasting services to inform, educate and entertain the people of Hong Kong.

RTHK paid an extremely important role in the broadcasting throughout the history. At the very beginning it was only an amateur English broadcasting studio. Later on it was developed to provide Chinese services to meet the social needs. During the War time, it fell in the hand of Japanese military. At that time RTHK was extreme important for the political reasons. In the sixties RTHK was so important to provide news and information, especially weathering and typhoon forecasting, to reduce the possible damages and losses of the people and their properties. When television program became more popular in the seventies, Education TV programs of RTHK were produced for schools and public affairs TV programs were produced for the general public.

As approaching 2000, satellite services and various advanced technologies are available. RTHK 's program is now available in the internet and distance call for the foreign viewers and audience. There is great impact on the definition of broadcasting in the age of information when people now live and work in the cyber space.

1.2 NEEDS

The existing RTHK headquarters was built in 1969, which is now outdated and inadequate to provide best services for the ever increasing and changing functions. The existing workplace of RTHK is inadequate in terms of space and technology, inflexible design and lack of facilities for outdoor functions. The key issue is that it is not flexible enough to cope with the social and technical changes.

RTHK is charged with providing a two - way communication channel between government and community. RTHK acts not only as a public service broadcaster but also as a 'listener' of the public, rather than just a government mouthpiece. New design needs to re-establish a closer relationship and better interaction between RTHK and general public. Direct physical contact, certainly, is the most direct and native communication methods which can fulfill the human needs. Hence it can allow free flow of news and exchange of ideas. As a result, this proposal is used to reinforce the mandate of RTHK to promote a better relationship between RTHK and public.

With the advance achievement in information technology, the choice of location of broadcasting studio can be more flexible. With the opening of Metro Broadcast in 1991 at one of the shopping arcades in Hung Ham, this demonstrates the feasibility of transparent studios in a noisy and public environment. Also the miniaturized equipment and portable computers enable the minimization and mobility of the working space. This technology helps in visualizing a new architectural form of broadcasting studio

1.3 BRIEF

The program concludes that a relocatable multi-media station would be able to meet the client's needs.

A new multi-media studio for RTHK is proposed to utilize the advantages of mobile broadcasting facilities to order to make closer contact and interaction to the public. The proposed multi-media station includes radio broadcasting studio, exhibition station, computer networking station, TV station and other working space and supporting facilities which are to provide functions of entertainment and information for the general public.

The new facilities need to be flexible so that it can change its functions in a reasonable time to accommodate different functional uses. As a result of that, the radio station can perform as a performance stage or an exhibition center when necessary. It should cope with the unpredictable functional changes in the future. Also the facilities should be ready for expansion.

1.4 PROGRAM

The program requires a flexible building system so that the same space can accommodate different functions and activities whenever necessary. Therefore the spatial requirement shows in this section serving as a guideline and it is not considered as an ultimate figure.

Both from practical and economical point of views, a modular design is adapted. Extension of space is achieved by addition of the module. New function may be introduced for technology and social change in the future.

For a clear zoning reason and better functional performance, two kinds of modular space are needed. The basic functional space is to perform the major functional activities such as broadcasting, exhibition, television broadcasting and computer networking broadcasting station. This kind of unit design has a strict performance, acoustic and lighting requirement. Another kind of space is to support the basic functional activities, which has a different performance requirement. This kind of space includes pantry, toilet, equipment storage and technical space.

The users of this relocatable studio are mainly disc-jockey (DJ). They are the music player as well as program holders. The new working environment for them is better than the old one since there are more chances to contact their audience and make new friends.

FUNCTIONS	USES OF SPACES	SPATIAL REQUIREMENT (M^2)
RADIO BROADCASTING	BROADCASTING STUDIO (for 4 person up)	12
	CONTROL ROOM	4
EXHIBITION / EDUCATION	RELOCATABLE EXHIBITION AREA	24
	TELEVISION SHOWCASE	4
TELEVISION BROADCASTING	BROADCASTING CONTROL ROOM	12
	DRESSING SPACE	6
	MAKING-UP ROOM	12
	PERFORMANCE STAGE	12
	STORAGE	24
COMPUTER-WEB BROADCASTING	COMPUTER NETWORKING CENTER	36
	NETWORKING CONTROL CENTER	4

FUNCTIONS	USES OF SPACES	SPATIAL REQUIREMENT (M^2)
SUPPORTING FACILITIES	TOILET	3
	PANTRY	3
TECHNICAL SUPPORTING SYSTEMS	GENERATOR & REGULATOR	12
	AIR-CONDITIONER PLANT ROOM	4
	TRANSMITTER	AS APPROPRIATE
	RECEIVER	AS APPROPRIATE
TECHNICAL SUPPORTING SYSTEMS	TECHNICAL EQUIPMENT SPACE	12
	NETWORKING SERVICES COMPUTER	4
	SOLAR ENERGY EQUIPMENT	AS APPROPRIATE
MULTI - FUNCTIONAL ROOM	STAFF WORKING SPACES / MEETING AREA /	6
	DINNING AREA / REFRESHMENT	6

2.0 DESIGN PHILOSOPHY

This project is to design a new relocatable station for one of RTHK's channels which can work effectively and efficiently to serve the public.. This architecture is also to be served as a prototype for other broadcasting stations.

2.1 MISSION

- To improve the interaction between Hong Kong people and Hong Kong / Chinese Government by improving the role of RTHK

2.2 GOALS

- To improve the communication channels between Hong Kong people and Hong Kong / Chinese Government, since RTHK can serve as a two - way channel, by decentralized-station approach
- To redefine the role of RTHK in the age of information and explore an appropriate architectural form to reflect this.
- To create an environment in which can enjoy Freedom of Speech and Free Flow of Press.

2.3 OBJECTIVES

- To design a new station which will be a new icon of an independent governmental department to serve the public.
- To increase transparency of the operation of RTHK.
- To design flexible systems for new RTHK which can allow future expansion and ready for technology improvement.
- To design a prototype station for one of the RTHK's channels which can be applied to other broadcasting institute
- To improve the existing working environment of RTHK's staff
- To free up a chance of open up the existing record library and the other restricted facilities for the general public without disturbing the normal operation of RTHK

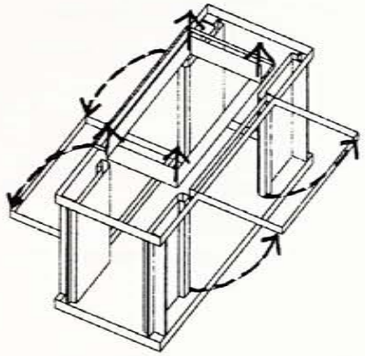
A transparent radio station is operating at Hung Ham constantly attracting different kinds of people.

2.4 GENERAL REQUIREMENT

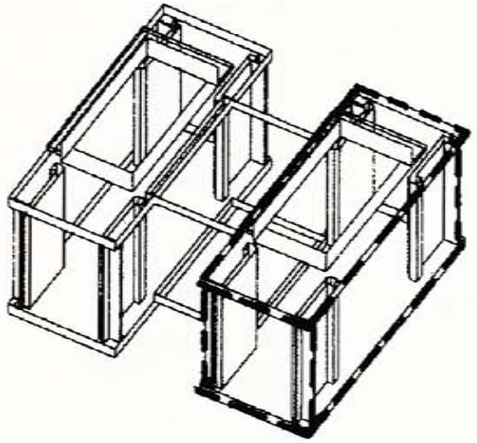
- To promote better communication between RTHK and public of different districts.
- To be relocated in different districts to perform outdoor broadcasting functions, which can allow more audience participate in the live programs.
- To perform the existing broadcasting functions such as programs arranging from 1 DJ to 4-people panel decision whereas the existing facilities can be dedicated for the general public's uses.
- To be flexible enough to perform other media functions such as networking programs if desired.
- To be capable of being extended to hold a mini-concert or public forum with public participants.
- To be highly visible from outside which allows visual connection between RTHK and public.
- A well-developed enclosure system should protect the station from weathering, especially when the units are moving from one place to another.
- The supporting facilities, such as toilet and pantry, should be provided for normal operation of the station.
- The architectural form of the Relocatable Broadcasting Station should be visually interesting and identifiable from a distant.
- All the building components should be able to be dismounted and remounted fairly quickly without involving unaffordable special skills.
- The largest building components should be able to be transported by the maximum sized vehicles without introducing any transportation problems.
- Building services systems, such as the air-conditioning systems, should fulfill the noise criteria of a normal broadcasting studio.
- The Studio should serve as an improvement of the existing standard.
- An energy supply unit / any other means of energy supply other than local power company supply, should be provided as an alternative solution for the energy source of the building.

3.0 BASIC DESIGN

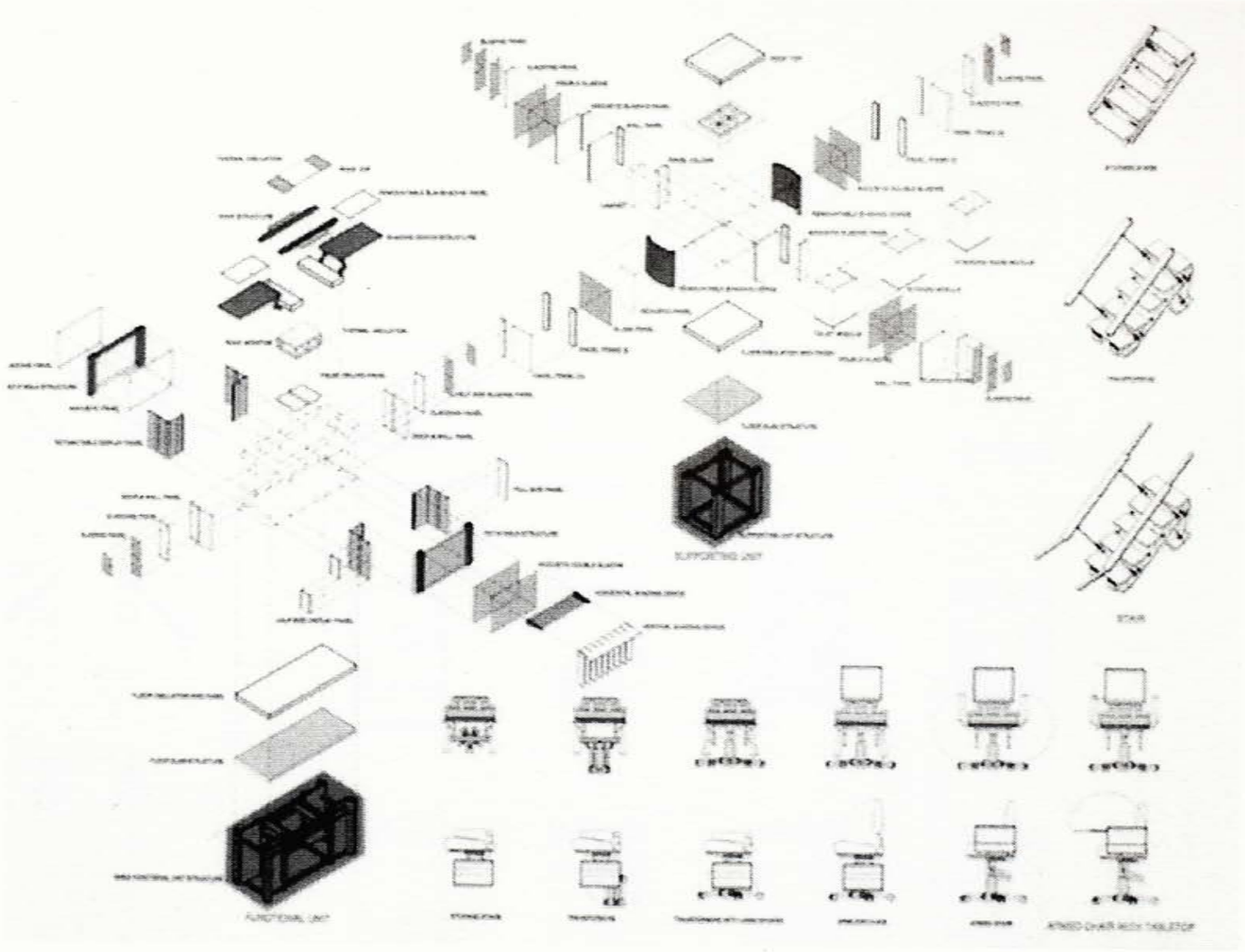
CONCEPT: FLEXIBILITY



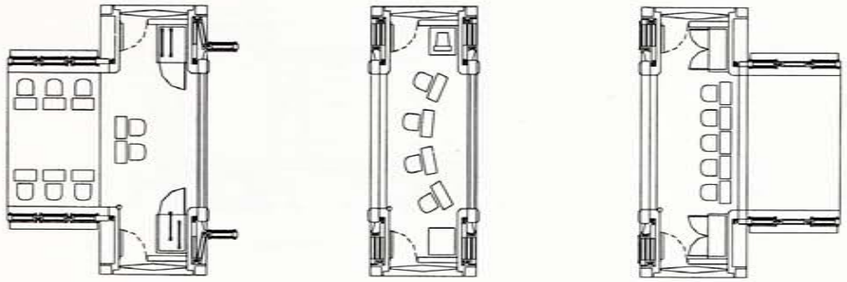
EXTENSIBLE



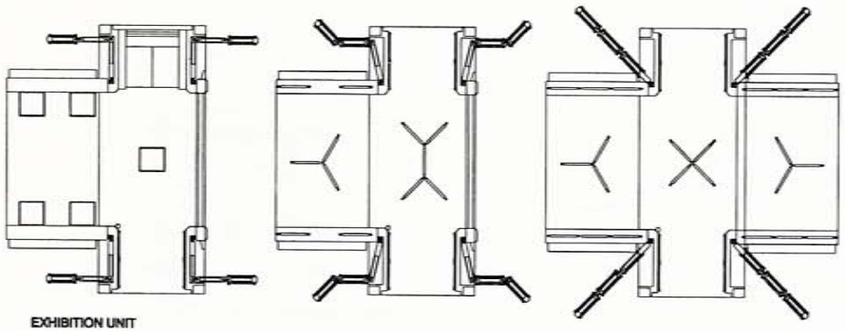
EXPANSIBLE



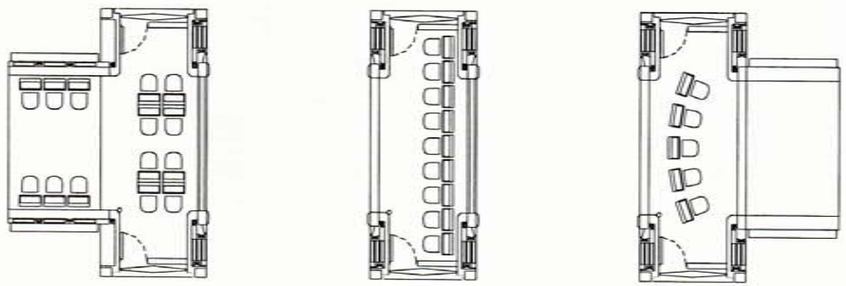
3.1 MODULAR DESIGN



BROADCASTING STUDIO



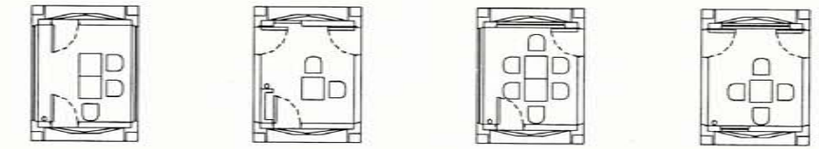
EXHIBITION UNIT



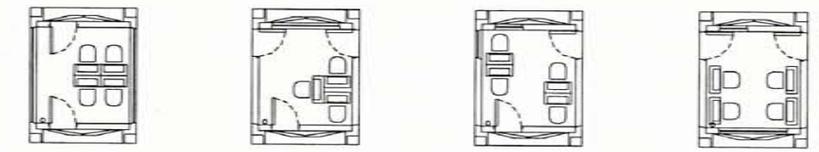
NETWORKING STUDIO

RADIO CONTROL ROOM

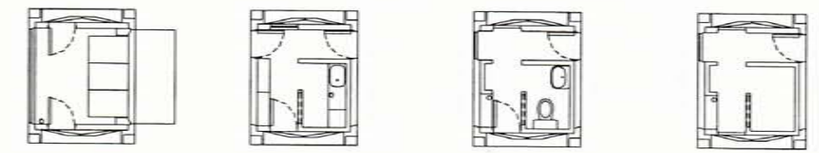
NETWORKING CONTROL ROOM



MULTI-FUNCTIONAL ROOM (for conferencing, eating, working, etc)



NETWORKING STUDIO



TELEVISION SHOW BOX

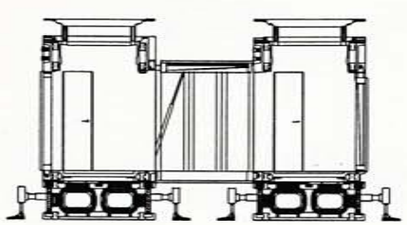
PANTRY

WASHROOM

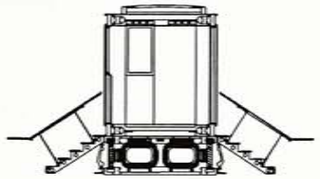
CHANGING ROOM

MODULAR PLAN

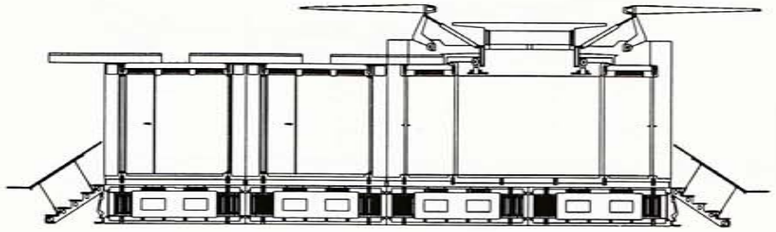
3.2 ORGANIZATION DESIGN



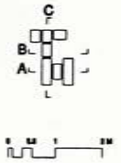
SECTION A

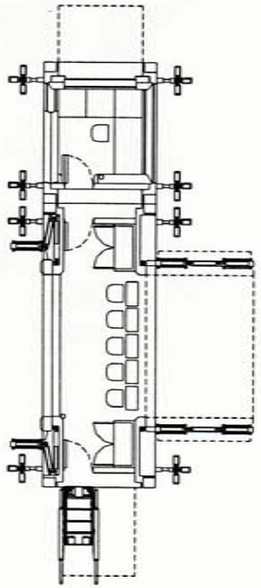


SECTION B

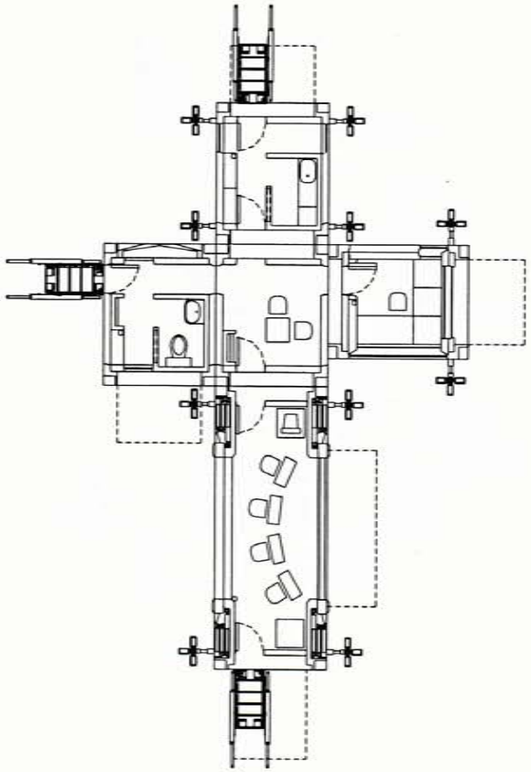


SECTION C





BASIC BROADCASTING STATION (1)



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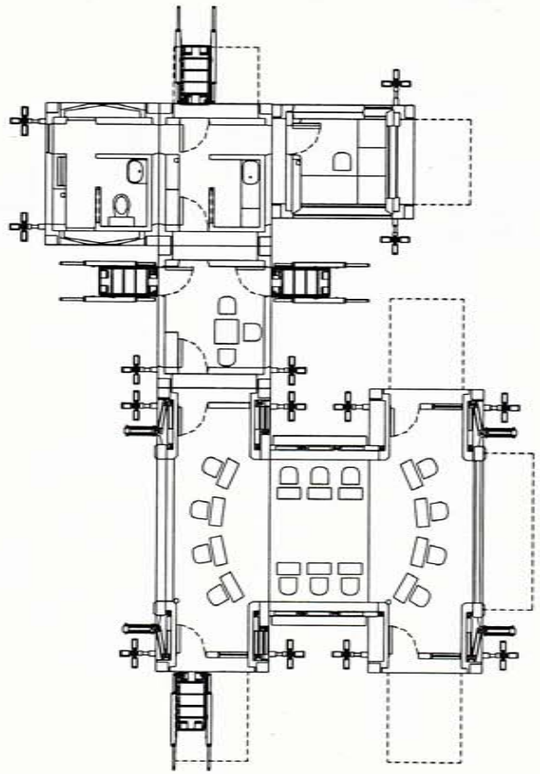

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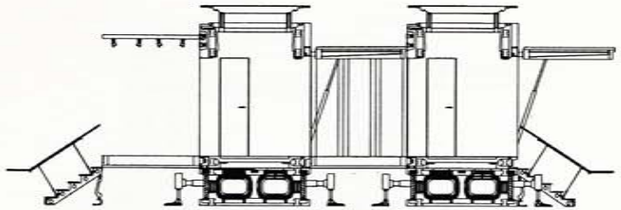
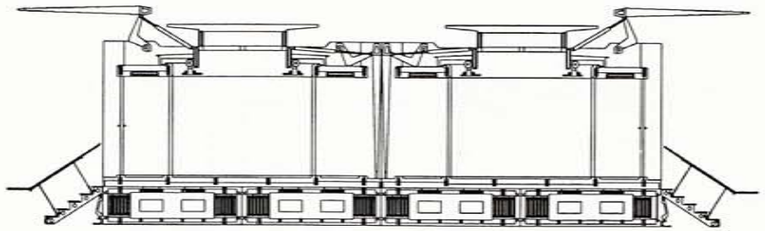
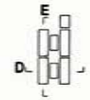
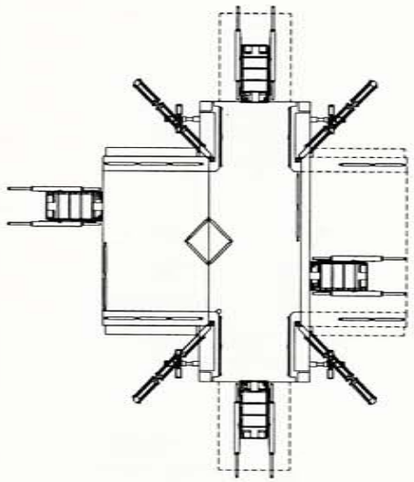


SECTION D



SECTION E





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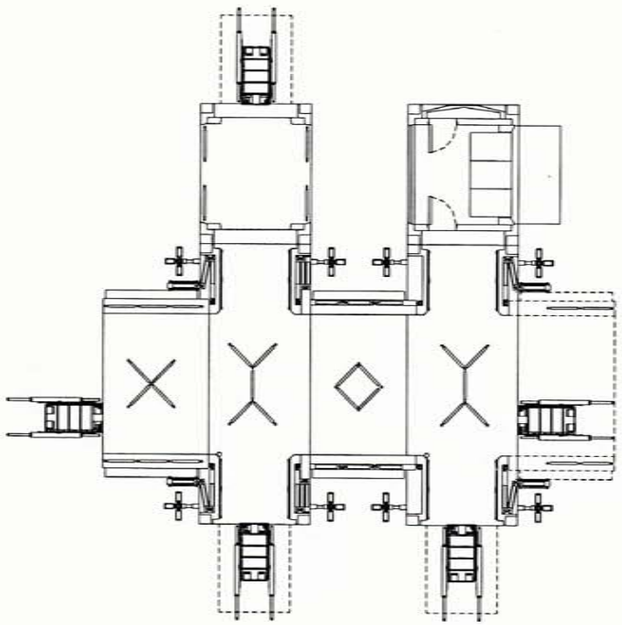

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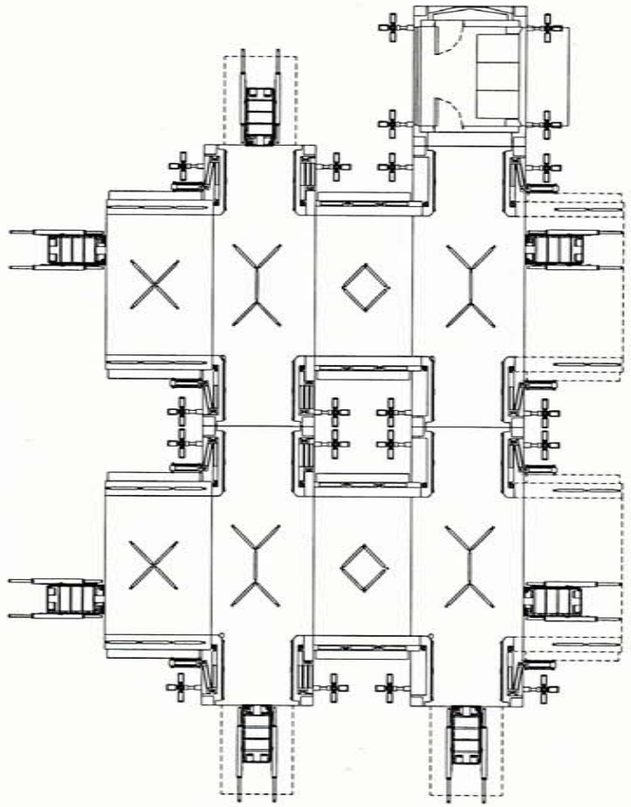
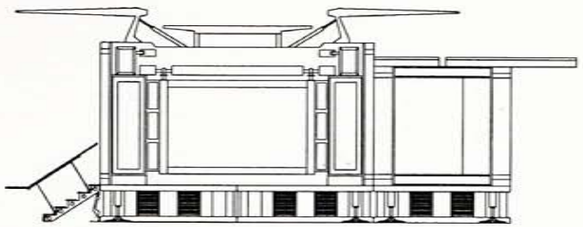
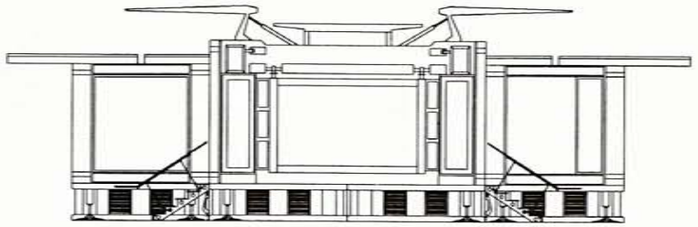


EXTENDED EXHIBITION STATION (3)

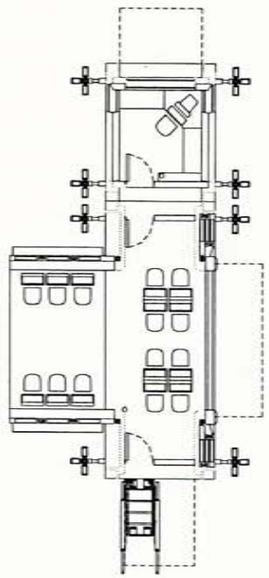
EXHIBITION STATION



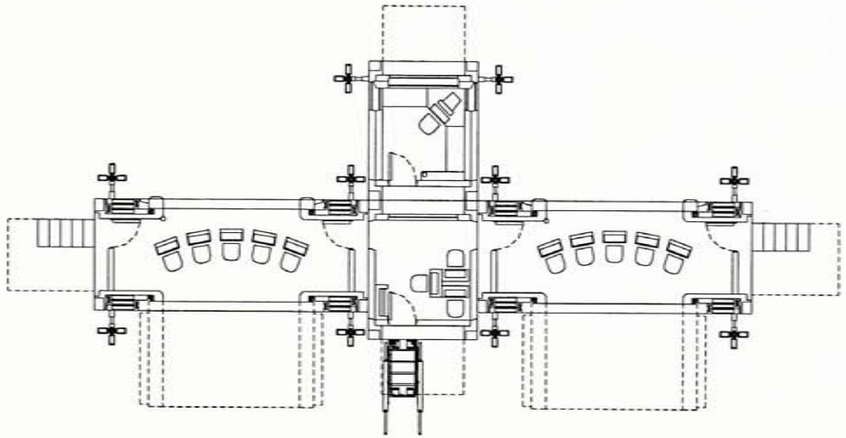
ELEVATION A



ELEVATION B



BASIC COMPUTER STATION (1)



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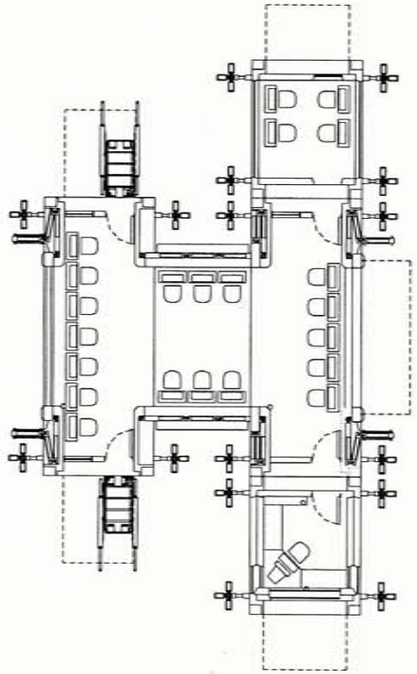
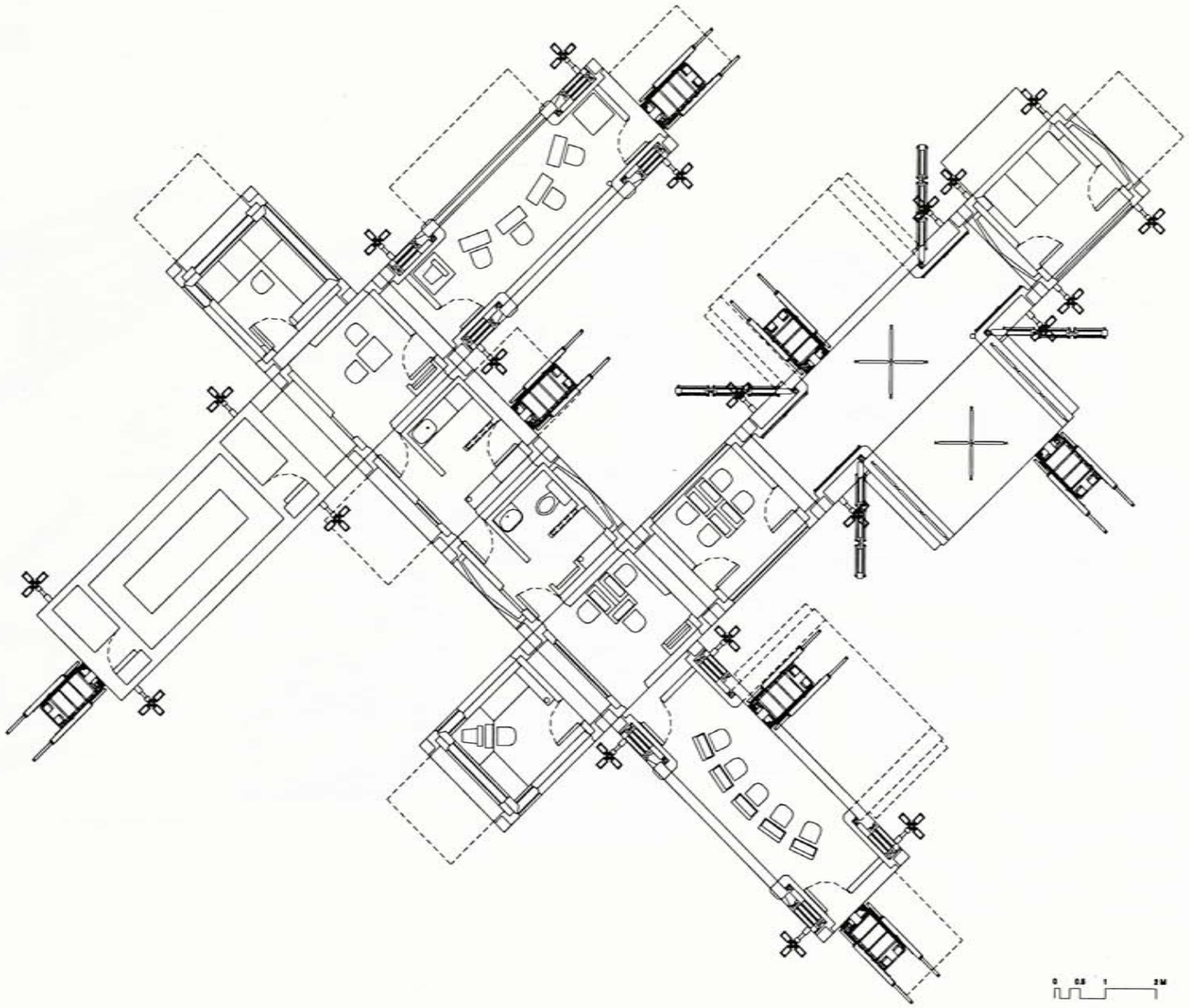


EXTENDED NETWORKING STATION (3)

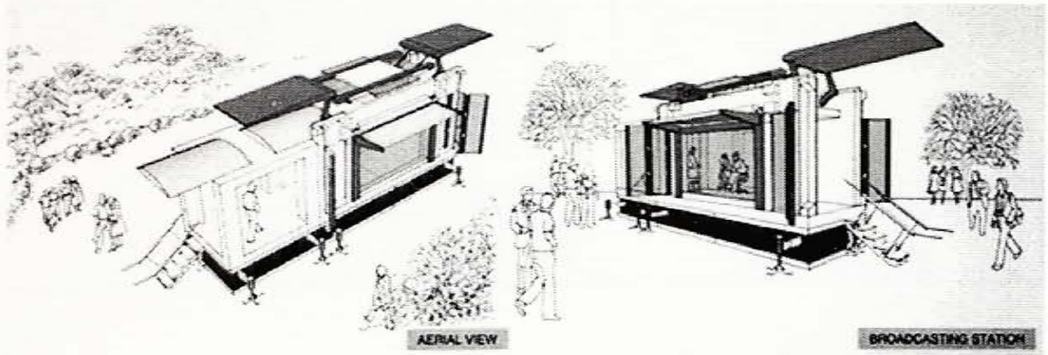
COMPUTER NETWORKING STATION

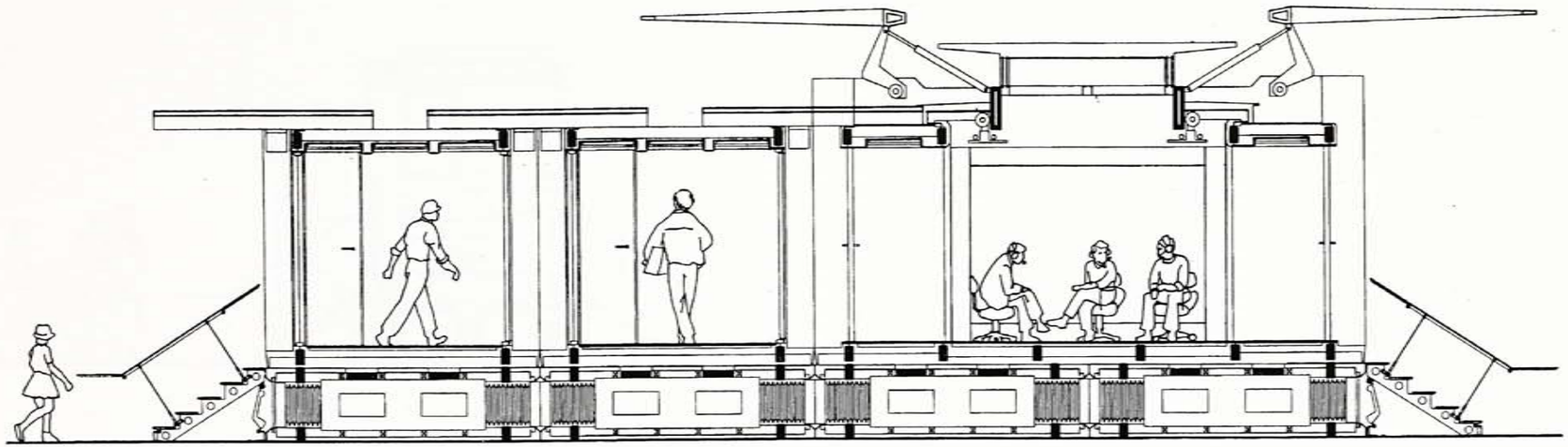


A MULTI-MEDIA STATION

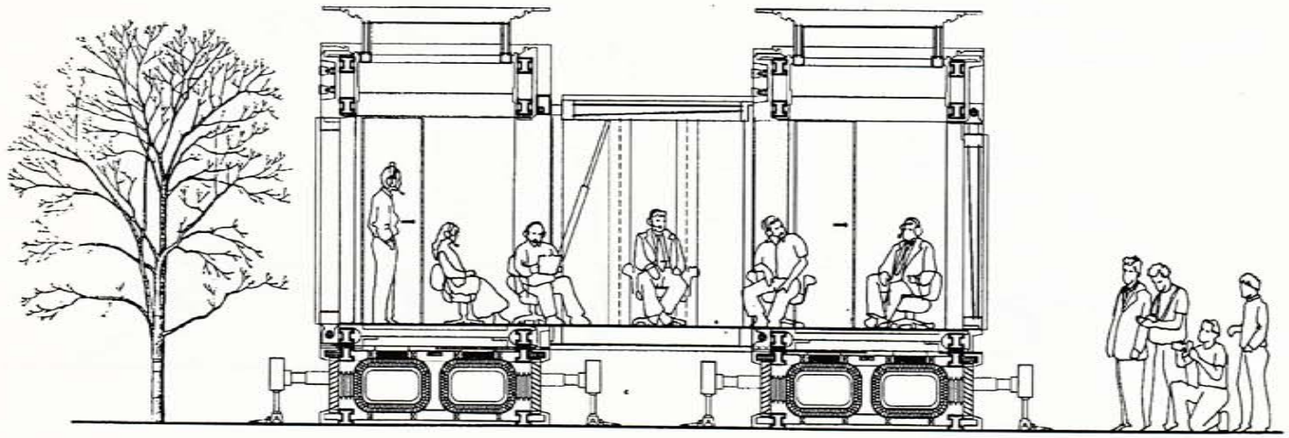
3.3 SPATIAL DESIGN

FUNCTIONAL ACITIVITIES

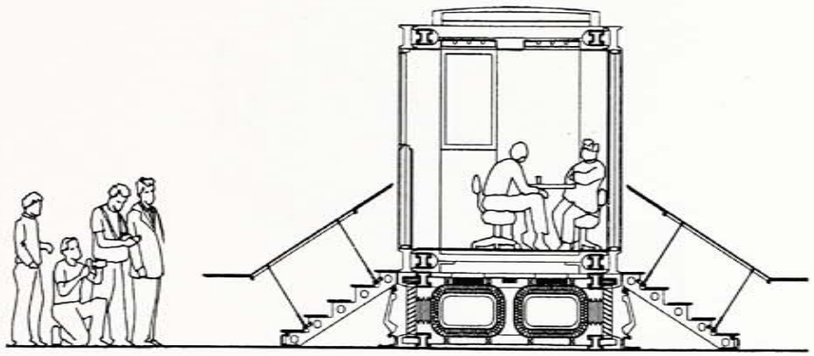




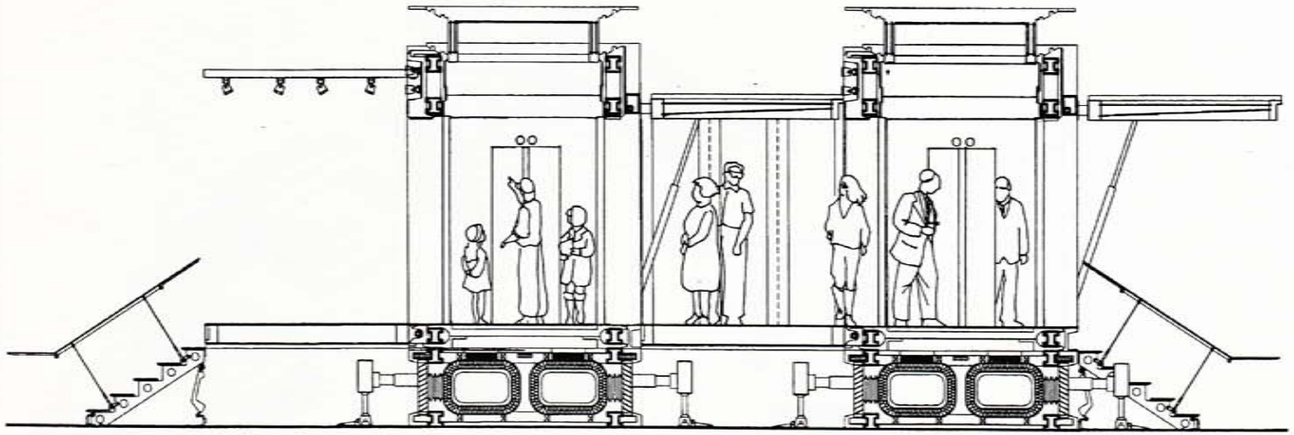
BROADCASTING STATION



BROADCASTING STUDIO

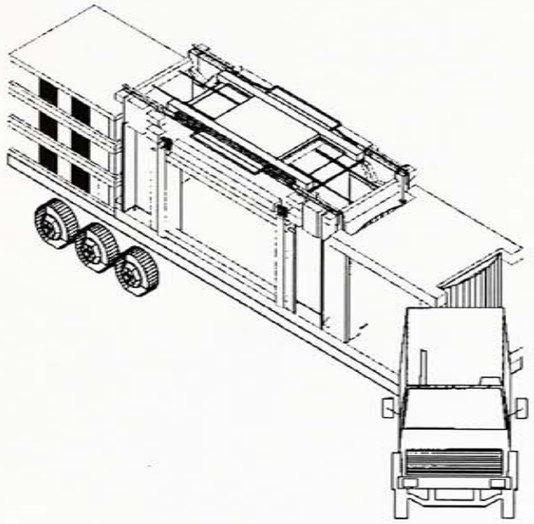


OFFICE SPACE

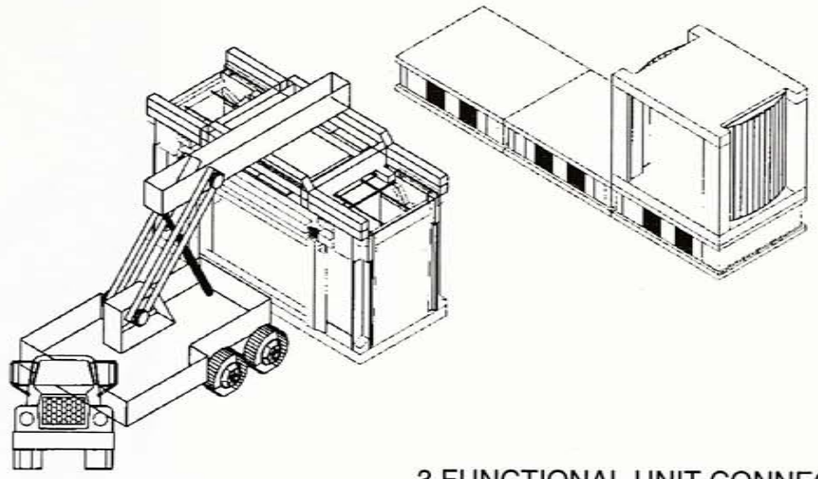


EXHIBITION SPACE

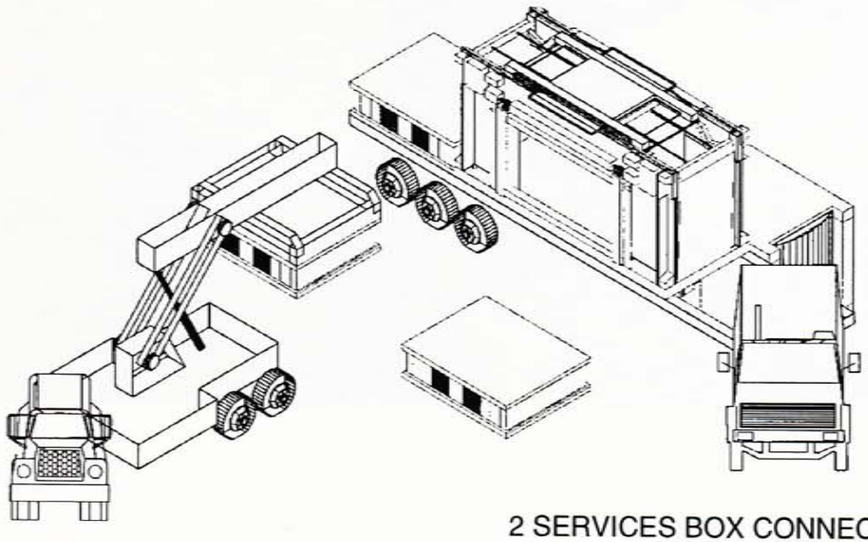
3.4 SETTING-UP DESIGN



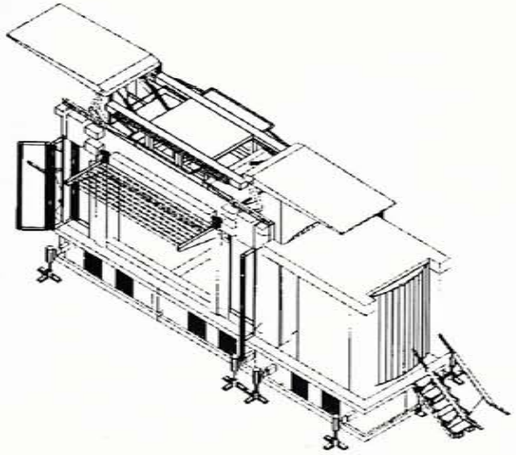
1 TRANSPORTATION



3 FUNCTIONAL UNIT CONNECTION

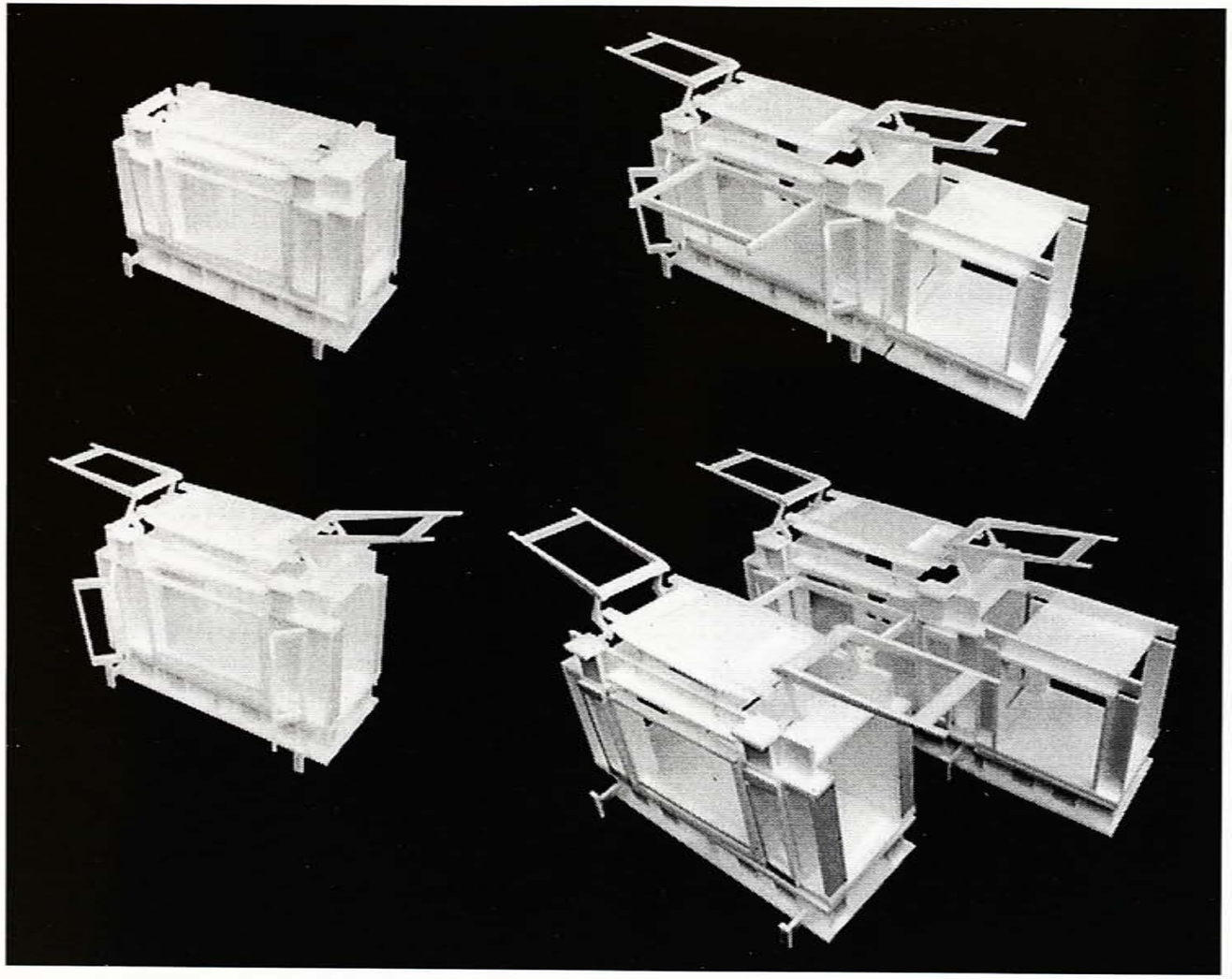


2 SERVICES BOX CONNECTION



4 STATION OPERATION

SETTTING-UP AND EXPANSION



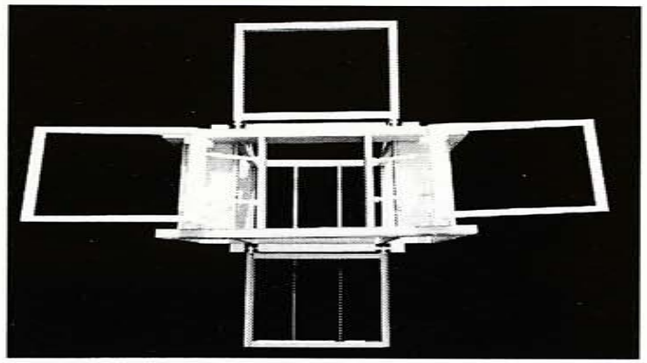
4.0 SAFETY

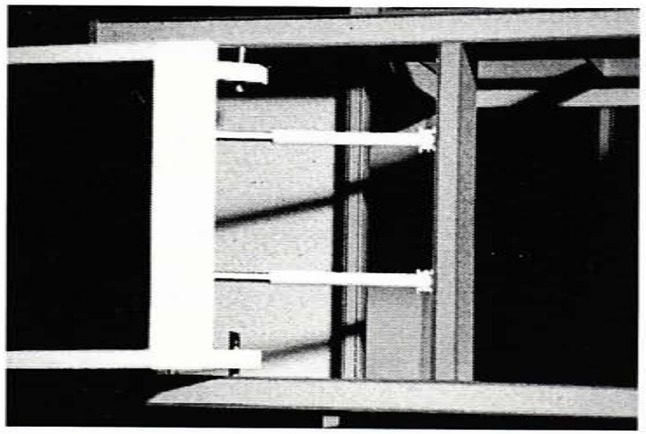
4.1 STRUCTURE

4.11 PERFORMANCE REQUIREMENT

	FLOOR LOADING
FUNCTIONAL UNIT	4 KN/M²
SUPPORTING UNIT	2.5 KN/M²

4.12 DESIGN STRATEGY





SIZING STRUCTURAL MEMBERS

(A) PRIMARY BEAM
The primary beams for the functional unit are I-section steel beam 152x152, steel grade 43 with mass 23 spanning 5.8M.

Check
Loading of functional unit = 2.5 x 6 x 2.4 = 36KN
Loading of the beams from table 4.1
Spanning = 6M
Loading = 36KN OK

(B) SECONDARY BEAM
The secondary beams for the functional unit are I-section steel beam 76x152, steel grade 43 with mass 23 spanning 1.5M.

Check
Loading of functional unit = 2.5 x 6 x 2.4 = 36KN
Loading of the beams from table 4.1
Spanning = 1.5M
Loading = 36KN OK

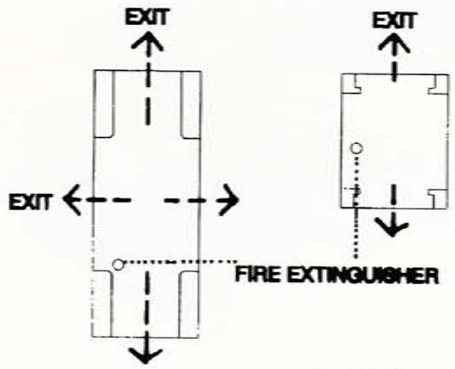
4.2 FIRE SAFETY

4.21 PERFORMANCE REQUIREMENT

The space should be a safe place in term of fire-hazards.

4.22 DESIGN STRATEGY

According to the British Loss Prevention Council (LPC), the fire risk for this relocatable unit is considered Light Hazards (LH) since the amount and combustibility of the contents are low.



FIRE SAFETY

(A) MEANS OF ESCAPE

The volume of the functional units and supporting units is considered small. There are more than one fire exits in each unit. Fire escape for the units should be very easy. In term of fire, the units can be considered very safe.

(B) FIRE COMPARTMENTATION

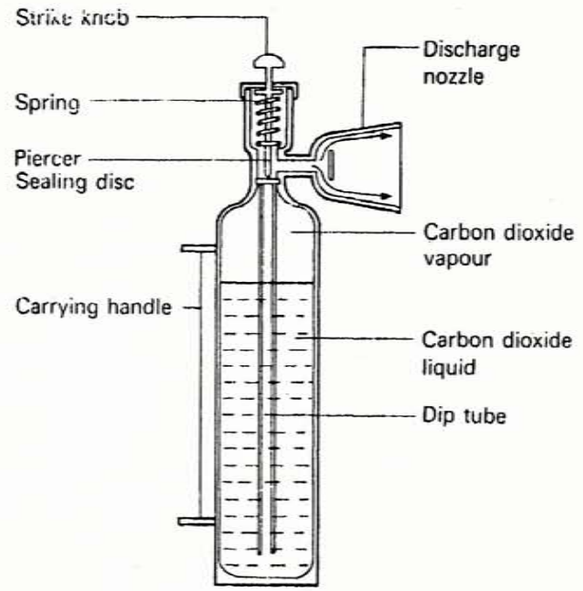
As for the local fire regulation, continuous volume exceeds 28000M³ should have fire compartmentation for safety reason.

Check
Volume of each functional unit
=2.4 x 6x 3.2
= 46.08M³
Total numbers of units requiring compartment
=28000/46.08
=607.64
Therefore total units numbers cannot exceed 607.

In reality, the numbers of units would not exceed 30.

(C) FIRE FIGHTING

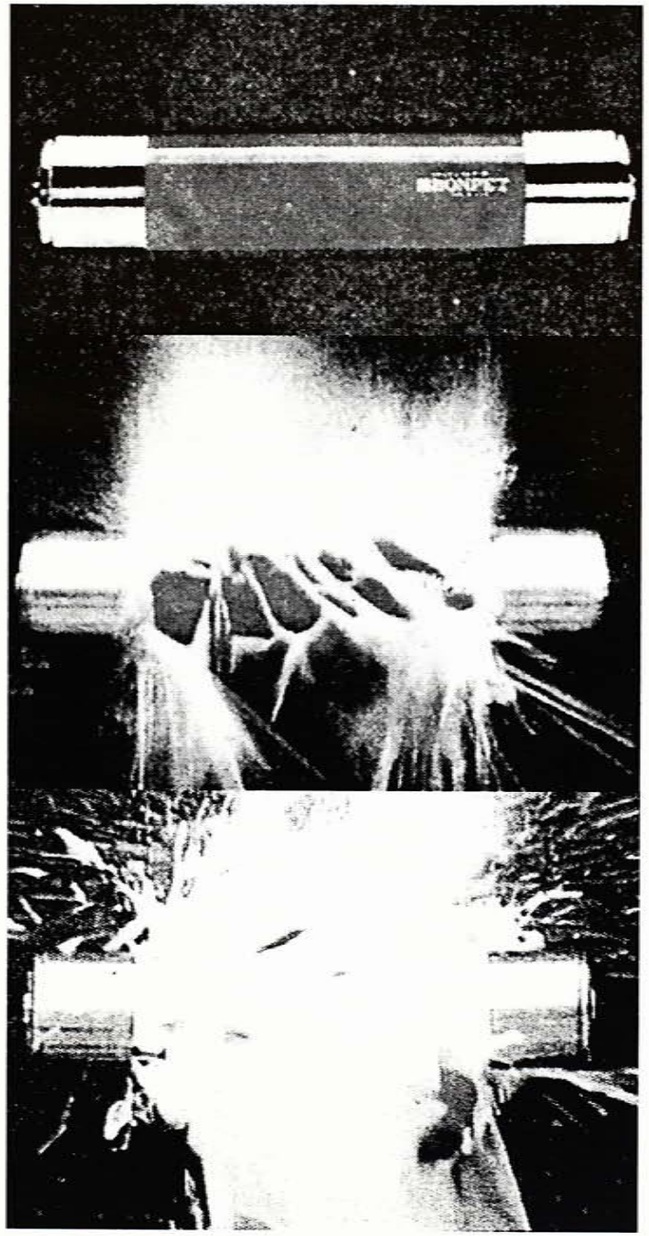
Each functional and supporting unit has one fire extinguisher. Carbon dioxide extinguishers are chosen in this design since electrical fire risk is highest among all kinds of fire. The fire extinguishers are located at a notable place and it can be easily operated by one person.



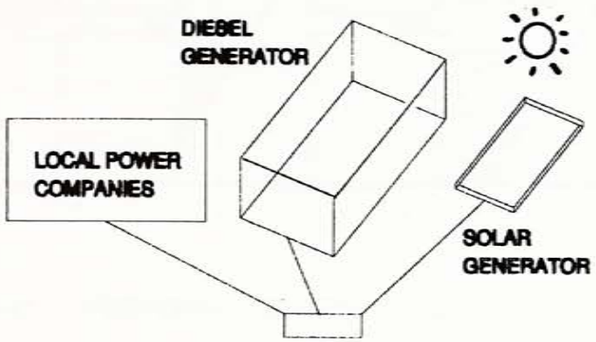
CARBON DIOXIDE FIRE EXTINGUISHER

(D) AUTOMATIC FIRE FIGHTING

A new automatic fire-frighting device is installed at the ceiling of the functional and supporting units to fright against fire. The total lenght of the device is only 280mm. It operates when it reaches at high temperature (80°C). The internal liquid will expand and break the capsule automatically. The inside chemicals will then splash covering about 10m². The capsule has a valid period of 3 years.



5.1 ENERGY STRATEGY



5.11 PERFORMANCE REQUIREMENT

Energy supplies should be steady, reliable and fit for the purposes. Maintenance should be minimal.

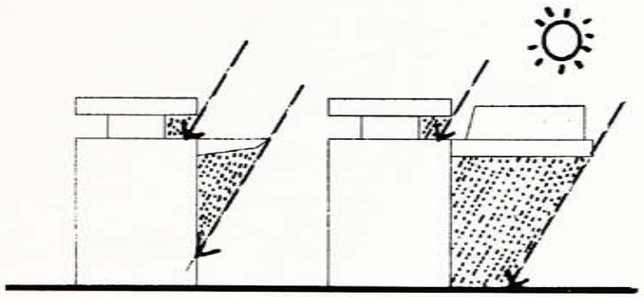
5.12 DESIGN STRATEGY

One of the problems that the relocatable units need to overcome is the energy supply. Since the units cannot rely only on the local power supply companies, it should have its own power source. As a result, three kinds of energy sources are used in this design.

Power companies can be one of the energy source, however, it depends on the site location chosen. Diesel generator should be another important power source since it can reliably supply power for the units during a certain period of time. Solar generator can be supply energy for the units but it depends on the location and weathering. A computer control system is provided to monitor the energy supply sources to give the best economical reason.

It should be emphasized that solar energy can be very useful in this relocatable design. Using solar energy or photovoltics is ideal because radio transmission needs only very small energy but PV is a reliable power supply. Also the system requires little or almost no maintenance.

5.2 LIGHTING STRATEGY



5.21 PERFORMANCE REQUIREMENT

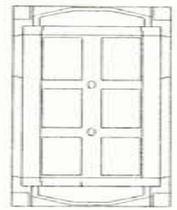
Artificial lighting design should comply with the natural lighting to evoke a sense of harmony. There should not have uncomfortable glare. The uniformity ratio (minimum to maximum illuminance) across a room should be at least 0.7 for comfort reason. The lighting intensity of the functional units should range between 300-750 lux. High color redering (97-100) lighting is required. Special threater spot lighting should be provided for performance stage.

5.22 DESIGN STRATEGY

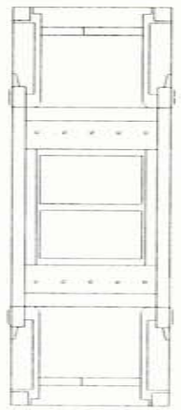
For natural lighting, there are 17.85% of total surface area is transparent glazing area for daylighting and an additional 4% adjustable roof monitor glazing area for indirect daylighting. The glazing area is at the longer edge for even light intensity distribution.

Both spot lighting and fluorescent light are provided for the users's choice. Variation of light intensity can be achieved by applying adjustable lighting control.

A range of remountable sun-shading device is developed for shading the glazing in different orientation. Horizontal shading device is attached to the units when the glazing is facing east, south or north. Vertical shading device is attached when facing west.



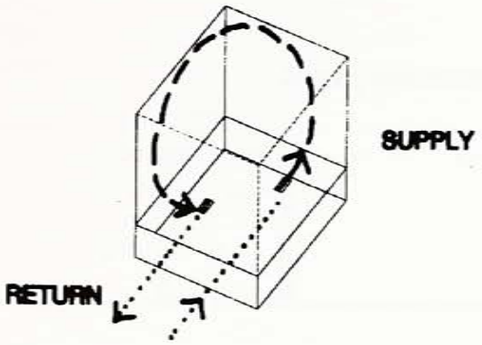
SUPPORTING UNIT



FUNCTIONAL UNIT

REFLECTIVE CEILING PLAN

5.3 NATURAL VENTILATION AND HVAC



5.31 PERFORMANCE REQUIREMENT

For comfort reason, the fresh air supply rate should be at least 10 l/s per person. Air velocity should be between 0.1 to 0.33 m/s or number '2' in Admiral Beaufort number. In Hong Kong climatic context, dehumidifying machine is required to the air humidity not exceeding 70%. Air temperature should keep between 17-25°C which within in the human comfort zone.

5.32 DESIGN STRATEGY

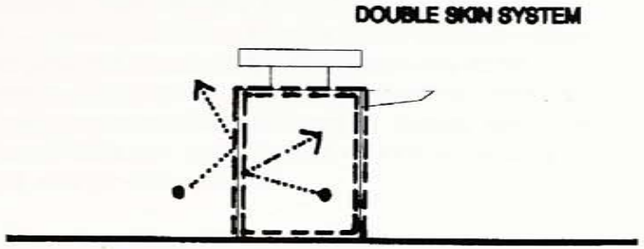
(A) NATURAL VENTILATION

For normal situation, the functional units are air-sealed that it has no natural ventilation. However, the functional units can be 'opened up' to create a semi-open space. At this stage, there are approximate 35.70% outer skin area is opened for ventilation.

(B) AIR-CONDITIONING SYSTEM

The constant -volume Direct Exchange (DX) all-air air-conditioning system is employed for this design. It is because the major plant can be centrally located in an unoccupied area which can facilitate operation, maintenance and noise control. Heat exchange in the central plant can be done by air-cool radiator. The system is also better than air-and-water system because it requires no chilled water and condensation drain piping works. The system can avoid the installation of Fan-Powered Terminals (FAT), which is needed to improve ventilation in Variable Air Volume (VAV) system, to minimize the noise impact to the noise sensitive zone.

5.4 ACOUSTICS



5.41 PERFORMANCE REQUIREMENT

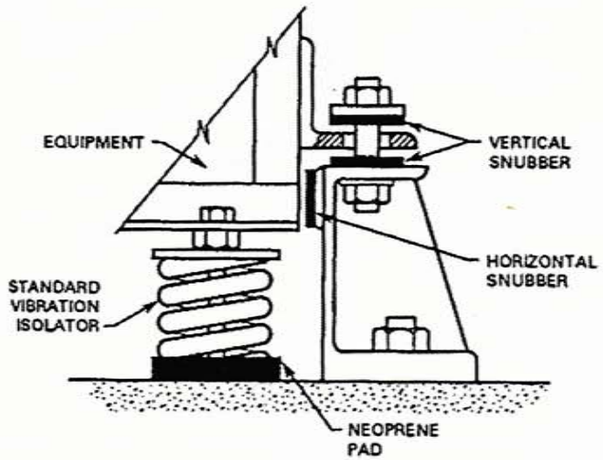
The Noise Criteria (NC) level is set at 25dB for radio broadcasting purposes and 40dB for others. The Reverberation time should not be between 0.4-0.6s.

5.42 DESIGN STRATEGY

DESIGN AGAINST STRUCTURAL-BORNE SOUND

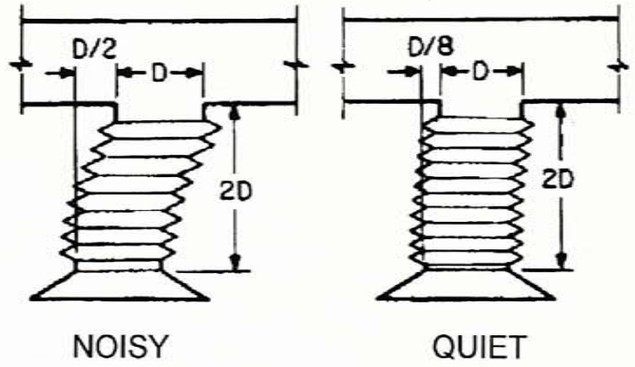
The structural-borne noise is the impact of noise through the floor structure or the vibration of ventilating plant through the structure or through the ventilation ducts.

The final design is to minimize the solid borne sound by means of discontinuity. For the broadcasting studio, a high insulated floating floor and a resiliently suspended ceiling is to reduce the impact of solid-borne noise.



A typical vibration isolator against solid-borne noise

In order to minimize the vibration caused by the ventilation system, an all-air HVAC is chosen for this design. The advantages of this system is that it needs no Fan-Assisted Terminal (FAT) in the air-conditioning space.



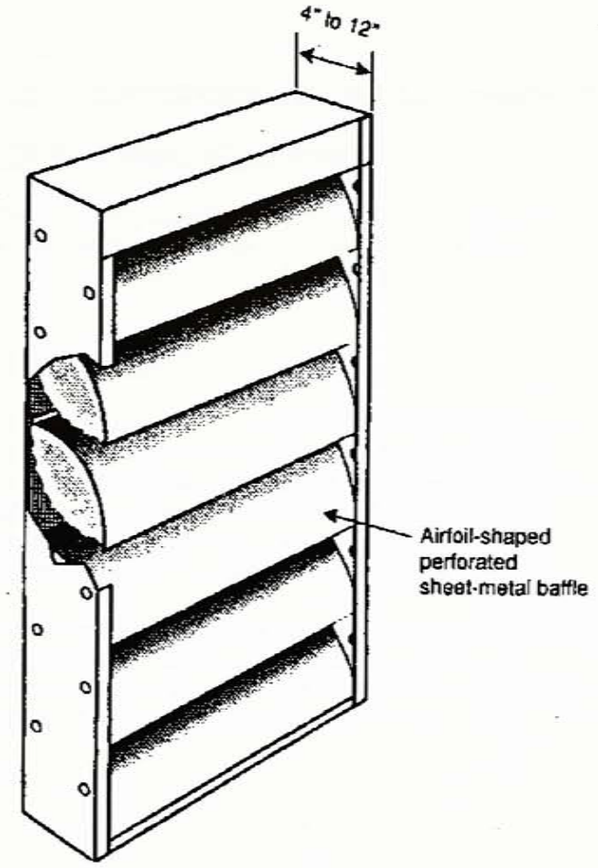
Optimum duct connection minimizing solid-borne noise

DESIGN AGAINST AIR-BORNE SOUND INSULATION

The functional units are considered as a noise sensitive design since it is required to perform radio broadcasting functions. Double layers of the envelope are provided to reduce the air-borne noise to the interior. The interior space are non-parallel surface to avoid resonance. Sound adsorptive panels, which are remountable, are applied to the interior of the units to give a better noise control.

In order to achieve the NC level 25 in a busy city street background, which has the noise level at about 55dB at night and 60dB at day time. The unit enclosure needs to have a Transmission Loss (TL) at least 35dB.

Detail design refers to special study - Skin.



Acoustic lourve can provided at the HVAC outlets and inlets for reducing noise impact from the environment to the inside.

5.5 UTILITY SERVICES

5.51 PLUMBING AND DRAINAGE

PERFORMANCE REQUIREMENT

An adequate plumbing and storage system are needed for the toilet and pantry use. All the drainage system should be outside the enclosure of the units to keep a weather-proof interior space.

DESIGN STRATEGY

For minimizing the capital and maintenance cost, the plumbing system for the units requires only one small water tank for each toilet and pantry. It can minimize the water piping works. Since the water tank can be installed at the roof-top of the supporting units, water can be downward delivery by gravity, ~~which~~ saving the uses of mechanical device.

The drainage system of the unit requires the enclosure free form the weathering. The rain water can only be drained away from outside to the ground. No temporary storage except for a chemical-treated sewage storage are provided for the toilet.

5.52 ELECTRICITY AND TELECOMMUNICATION

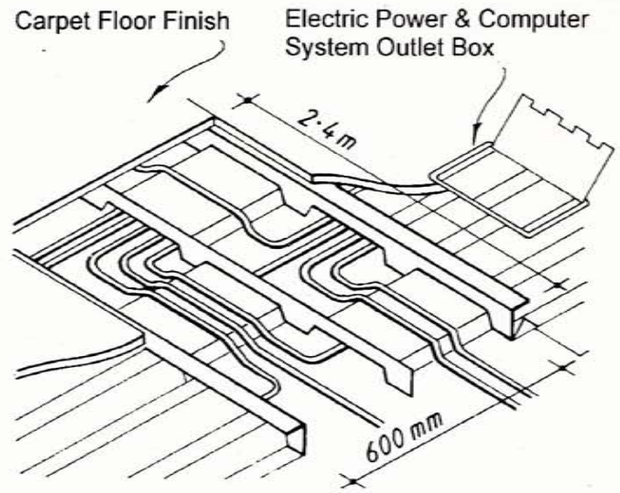
PERFORMANCE REQUIREMENT

The electricity and telecommunication ductworks should be located under floor surface and a number of outlets should be provided for flexible layout.

DESIGN STRATEGY

The electricity and telecommunication ductwork are located under the floor surface as required. As the functional units may change its layout and function for different purposes, the control of the lighting and movable part of the units are by infra-red remote control to avoid the reach by any visitors.

A cordless telecommunication system is install around the ceiling for cordless broadcasting activities. Communication between the controllers and speakers can be through their cordless earphone.



Under floor electricity and telecommunication system

6.0 COST

6.1 SOURCE OF FINANCE

This project is financially feasible with either from direct fund for RTHK or by sponsorship from charity organization, such as Hong Kong Jockey Club.

6.2 COST AND SOCIAL CONCERN

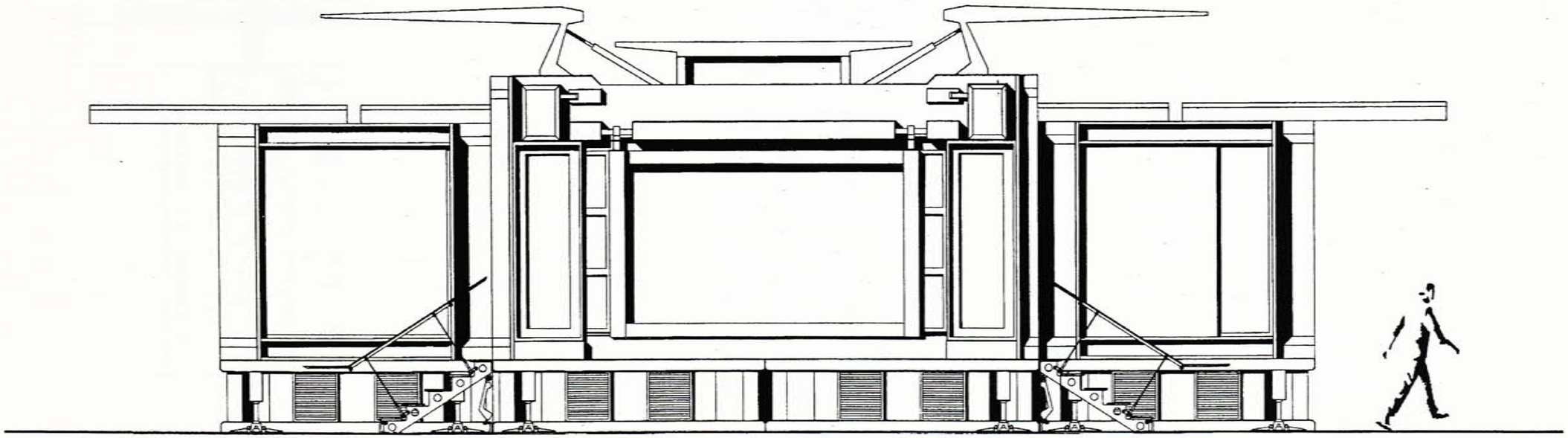
As RTHK is not a profit making organization and it aims at to serve the public by introducing quality program which are not produced from commercial sector.

The existing RTHK is financed solely from government and sponsorship and it does not have any advertisement income.

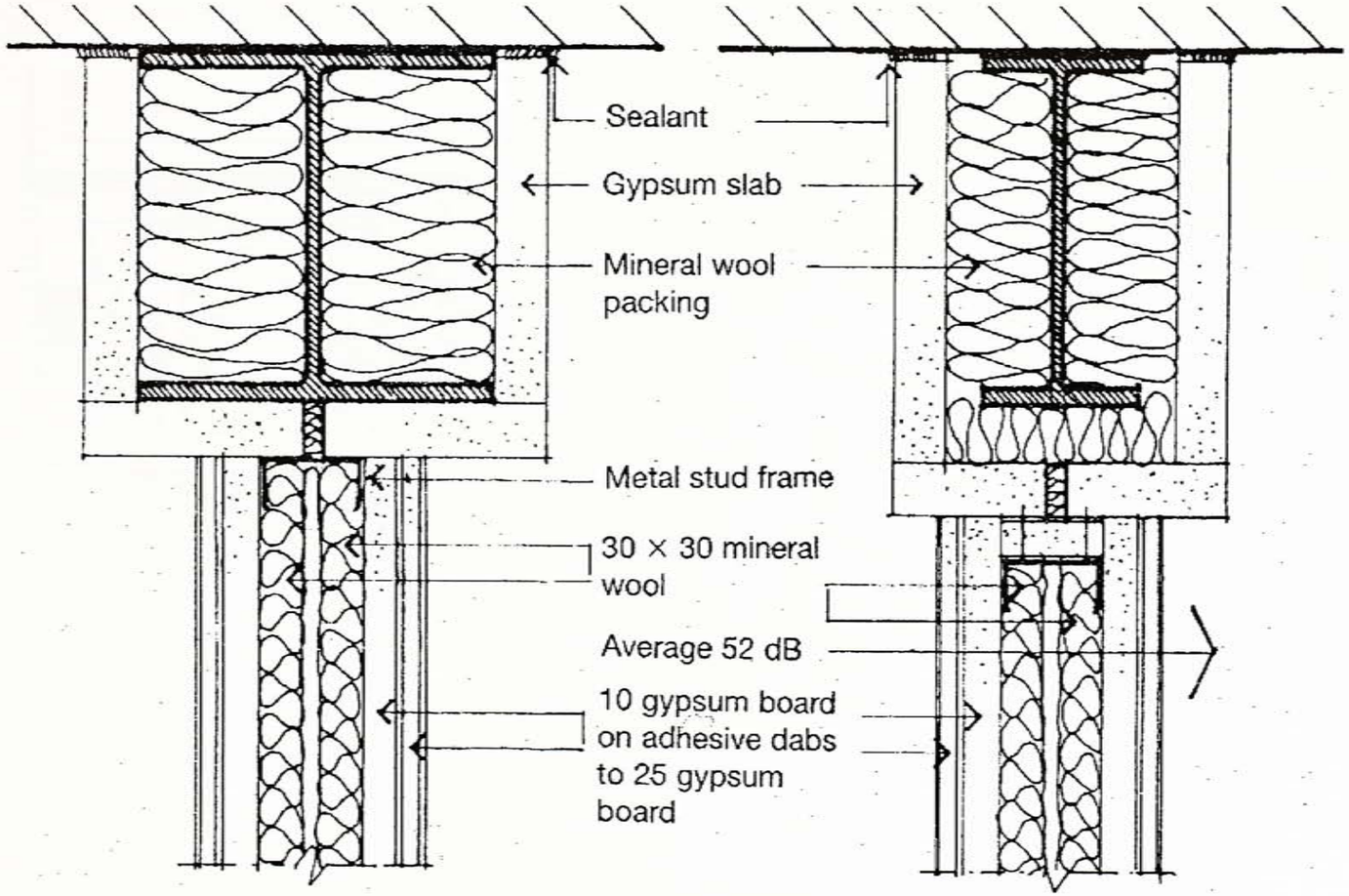
The success of the RTHK does not count on the investment and profit. More importantly, the success counts on the effectiveness of achieving its goal - communication between public and RTHK. A relocatable station, definitely, is a better choice to communicate with the public by its active participation in the community. This facilities can therefore improve the people life quality in the society.

7.0 SPECIAL STUDY: SKIN

7.1 SKIN DESIGN

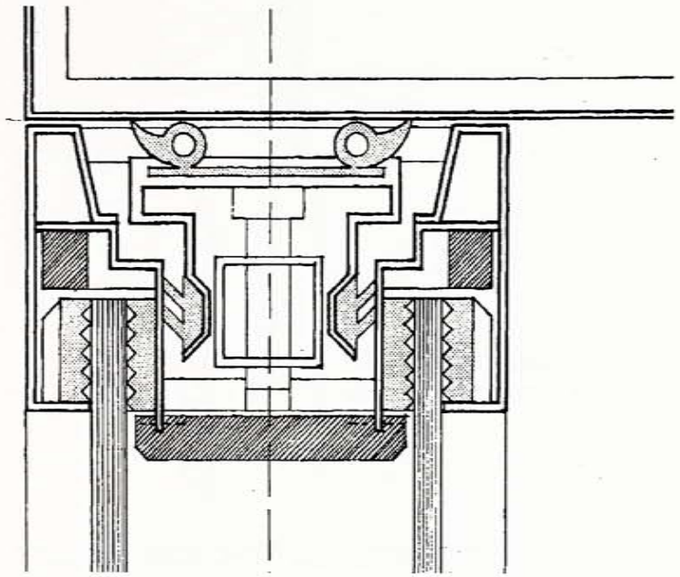


SKIN AN ENCLOSURE AND PROTECTION OF STRUCTURE

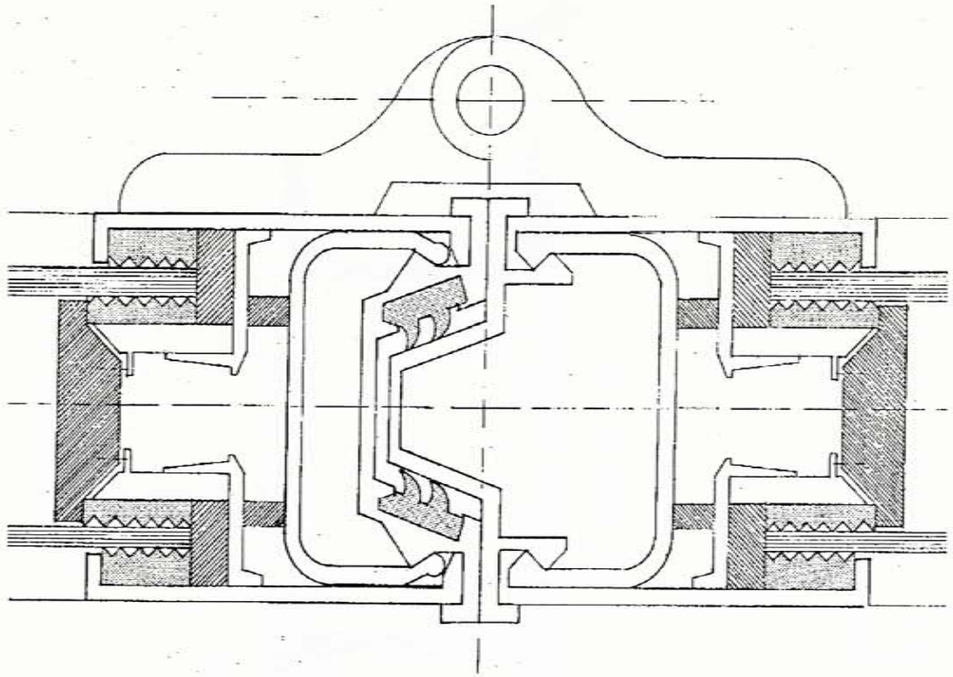


TYPICAL WALL CONSTRUCTION

SKIN A INTERFACE BETWEEN OUSIDE AND INSIDE

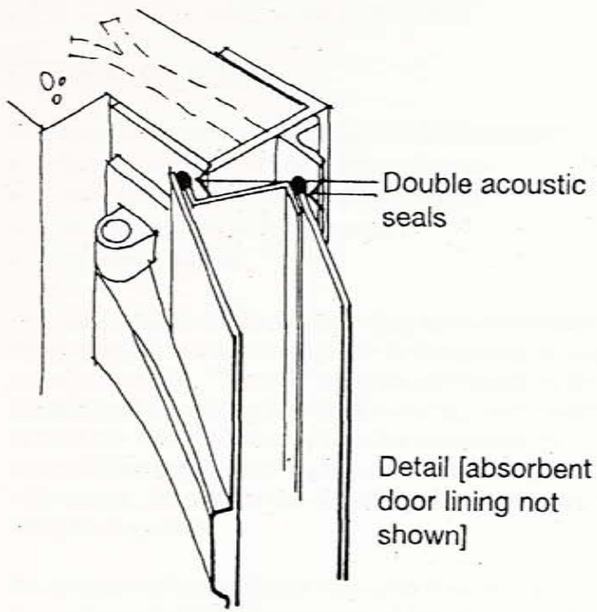


RETRACTABLE SEAL FOR MOVABLE SKIN

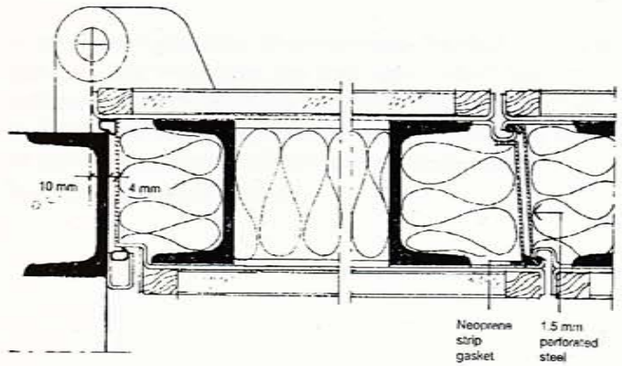


A DOUBLE SEAL FOR MOVABLE JOINT

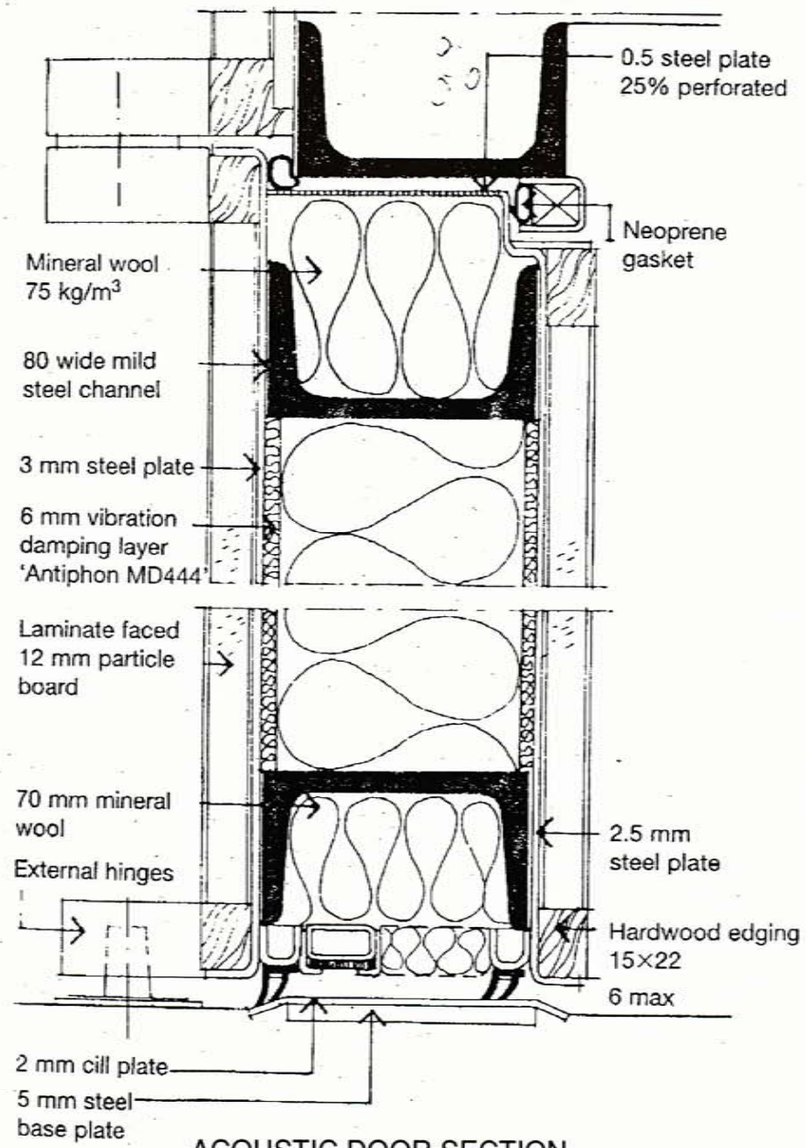
SKIN A MEASURE OF SECURITY



DOUBLE SEAL FOR ACOUSTIC DOOR



ACOUSTIC DOOR PLAN



ACOUSTIC DOOR SECTION

7.2 THERMAL PERFORMANCE

7.2.1 ENVIRONMENTAL COMFORT

THERMAL COMFORT

The most important thermal comfort factors are:

- the temperature of the surrounding air
- the mean radiant temperature (MRT)
- the relative humidity of the air
- the motion of air

The temperature of the surrounding air is controlled by the supply of cool air or warm air to the space through ductwork or skin. The MRT may be controlled by the radiant heat panels or 'washing' a surface with warm or cold air. The air humidity is to be controlled by dehumidifier machine or by the air-conditioning system with reheat. Air motion can be achieved by mechanical ventilation system.

As to respond to functional activities changes and thermal comfort, the skin design of the relocatable RTHK studio can be opened or closed to have different thermal performance.

In the 'open' situation, the complete thermal control is not possible. However, the thermal comfort can be achieved by adjusting the humidity and motion of air. In the 'close' situation, there are more complete control of the air and mean radiant temperature, relative humidity and motion of air.

7.2.2 THERMAL TRANSFER

OTTV CONCEPT

The following OTTV calculation, which is used by Hong Kong Building Department, is to estimate the overall thermal transfer from the environment to the building with Hong Kong's context.

OTTV for an External Walls:

$$OTTV_W = [(A_W \times U \times \alpha \times T_{DEQw}) + (Af_W \times SC \times ESM \times SF_V)] / Ao_W$$

OTTV for a Roof:

$$OTTV_R = [(A_R \times U \times \alpha \times TD_{EQR}) + (Af_R \times SC \times SF_H)] / Ao_R$$

where

A_W	= Area of Opaque Wall, m²
U	= Thermal Transmittance of Opaque Wall / Roof, W / m² °C
α	= Absorptivity of Opaque Wall / roof
TD_{EQw}	= Equivalent Temperature Difference for Wall, °C
Af_W	= Area of Fenestration in Wall, m²
SC	= Shading Coefficient of Fenestration in Wall / Roof
ESM	= External Shading Multiplier
SF_V	= Solar Factor for the Vertical Surface, W / m²
Ao_W	= Gross Area of External Walls ($A_w + Af_W$), m²
A_R	= Area of Opaque Roof, m²
TD_{EQR}	= Equivalent Temperature Difference for Roof, °C
Af_R	= Area of Fenestration in Roof, m²
SF_H	= Solar Factor for the Horizontal Surface, W / m²
Ao_R	= Gross Area of Roof ($A_R + Af_R$), m²

THERMAL INSULATION

One of the most important factors to affect the thermal comfort in a close system is the thermal insulation. The thermal insulation is to control the heat transfer and therefore protect the buildings from excessive heat loss during cold seasons and heat gain during hot seasons. The effective control of the thermal insulation can reduce the amount of energy required by the building's heating and cooling equipment to maintain conditions for human comfort and therefore achieve energy efficiency.

U VALUES

The loss of heat of heat through a wall, floor or roof depends on the U value of the construction. U value can be calculated from the thermal resistivities (r).

HEAT FLOW EQUATION (Q)

$$Q = kA (T - t) / L$$

THERMAL RESISITIVITY (R)

$$r_1 = 1 / k_1$$

TOTAL THERMAL TRANSMITTANCE (U)

$$U = 1 / (R_i + R_a + R_o + x_1/k_1 + x_2/k_2 \ldots\ldots\ldots + x_N/k_N)$$

where

Q	= the Amount of Heat Flow, W
k	= the Total Thermal Conductivity, W/m°C
A	= the Area of the Material, m²
T-t	= the Temperature different of the thickness of the Material concerned, which is expressed, K
L	= the Thickness of the Material under consideration, m
r	= the Thermal Resistivity, m°C/W
U	= the Total Thermal Transmittance, W/m²°C
R_i	= the Surface Film Resistance of Internal Surface, m²°C/W
R_a	= the Air Space Resistance, m²°C/W
R_o	= the Surface Film Resistance of External Surface, m²°C/W
x_N	= the Thickness of the Building Material, m
k_N	= the Thermal Conductivity of the building material, W/m°C

The thermal conductivity of some of the building materials, which are approved by Hong Kong Building Department, are listed below:

Material	Density (Kg / m³)	Thermal conductivity (W / m.K)
Steel	7800	50
Aluminum Alloy	2800	160
Cork Board	145	0.042
Mineral Fibre Board	265	0.053
High Density Hardboard	1010	0.144
Plaster Board	950	0.16
Anneal Glass	2500	1.05
Polyurethane Foam	30	0.026
Expanded Polystyrene	25	0.034
Glass Fibre Mat or Quilt	32	0.035
Mineral Wool Felt	50	0.039

OTTV CALCULATION

Assumptions

For Simplicity reason, the followings assumptions are made:

- The Thermal Resistivity of External Surface Film is 0.044 W/m°C.
- The Absorptivity of the Air Space in the construction is above 0.5.
- The Thermal Resistivity of Internal Surface Film is 0.299 W/m°C.
- The Thermal Resistivity of Low-emission Glass is 1 W/m°C.
- The Thermal Resistivity of Laminated Glass is 0.8 W/m°C.
- The thermal implication of vertical structural members is negotiable.
- The Shading Coefficient (SC) of the twin glass system is 0.3.

Skin Area:

Description	**Opaque Area (m^2)**	**Glazed Area (m^2)**
Glazed Facades	6 x 3.1 - 6 = 12.6	3 x 2 = 6
Short Facades (A)	2.4 x 3.1 = 7.44	
Short Facades (B)	2.4 x 3.1 = 7.44	
Long Facades	6 x 3.1 = 18.6	
Roof	6 x 2.4 =14.4	

U value of a typical wall of Long Facades:

Material	Density (Kg/m^2)	Thermal Resistivity ($W/m°C$)
External Surface Film		R_o = 0.044
1 mm Aluminum Cladding Panel	0.001 x 2800 = 2.8	0.001 / 160 = 0.0000062
3 mm Structural Steel	0.003 x 7800 = 23.4	0.003 / 50 = 0.00006
100 mm Glass Fibre Insulation	0.10 x 32 = 3.2	0.10 / 0.035 = 2.8571
50 mm Air Space (α above 0.5)		R_a = 0.153
16 mm Plaster Board	0.016 x 950 = 15.2	0.016 / 0.16 = 0.1
Internal Surface Film		R_i = 0.299
	Overall Density = 44.6 Kg/m^2	Total Thermal Resistivity = 3.4531662 $W/m°C$

U value of the wall: = 1 / 3.4531662
= 0.2896 $W / m^2 °C$

U value of a typical wall of Short Facades:

Material	Density (Kg/m^2)	Thermal Resistivity ($W/m°C$)
External Surface Film		R_o = 0.044
1 mm Aluminum Cladding Panel	0.001 x 2800 = 2.8	0.001 / 160 = 0.0000062
3 mm Structural Steel	0.003 x 7800 = 23.4	0.003 / 50 = 0.00006
80 mm Glass Fibre Insulation	0.08 x 32 = 2.56	0.08 / 0.035 = 2.2857
100 mm Air Space (α above 0.5)		R_a = 0.160
16 mm Plaster Board	0.016 x 950 = 15.2	0.016 / 0.16 = 0.1
Internal Surface Film		R_i = 0.299
	Overall Density = 43.96 Kg/m^2	Total Thermal Resistivity = 2.8888 $W/m°C$

U value of the wall: = 1 / 2.8888
= 0.3462 $W / m^2 °C$

U value of a typical Roof:

Material	Density (Kg/m^2)	Thermal Resistivity ($W/m°C$)
External Surface Film		R_o = 0.044
1 mm Aluminum Cladding Panel	0.001 x 2800 = 2.8	0.001 / 160 = 0.0000062
3 mm Structural Steel	0.003 x 7800 = 23.4	0.003 / 50 = 0.00006
130 mm Mineral Wool Insulation	0.13 x 50 = 6.5	0.13 / 0.039 = 3.3333
100 mm Air Space (α above 0.5)		R_a = 0.160
16 mm Plaster Board	0.016 x 950 = 15.2	0.016 / 0.16 = 0.1
Internal Surface Film		R_i = 0.299
	Overall Density = 47.9 Kg/m^2	Total Thermal Resistivity = 3.9364 $W/m°C$

U value of the roof: = 1 / 3.9364
= 0.2540 $W / m^2 °C$

Equivalent Temperature Difference for Wall

For the purpose of comparing the orientation impact to the design, the equivalent temperature difference for wall (TD_{EQw}) facing West and facing North are listed in the followings.

Orientation	Wall Density between 23-199 Kg/m²
North	3.38
East	6.68
South	5.01
West	5.79

External Shading Multiplier (ESM)

The Design is equipped with two kinds of remountable shading devices for different orientation. The horizontal shading device has the overhang projection factor (OPF) about 0.5 and the vertical shading device has the sidefin projection factor (SPF) about 1.

Overhang Projection Factor (OPF)	Sidefin Projection Factor (SPF)	External Shading Multiplier (ESM)	
0.5		N W	0.781 0.672
	1	N W	0.370 0.604

Equivalent Temperature Difference for Roof

The Roof density which is between 23-199 K g/m² has the Equivalent Temperature Difference 16.88.

Solar Factor

Orientation	Vertical	Horizontal
N	104	
W	175	
N, E, S, W		264

Heat Gain Calculation (i)

SITUATION A: GLAZED AREA FACING WEST WITH VERTICAL SHADING DEVICE

Description	Glazed Area (m^2)	SC	ESM	SF	Heat Gain (W)
Glazed Facades	6	0.3	0.604	175	190.26

Description	Opaque Area (m^2)			U value ($W/m^2\,°C$)	α		TD_{EQ} (°C)	Heat Gain (W)		
	Fixed Part	Movable part	Total		Fixed Part	Movable part		Fixed Part	Movable part	Total
Glazed Facades	8.98	3.62	12.6	0.2896	0.25	0.75	5.79	3.7644	4.5525	8.3169
Short Facades (A)	2.40	5.04	7.44	0.3462	0.25	0.75	5.01	1.0407	6.5563	7.5970
Short Facades (B)	2.40	5.04	7.44	0.3462	0.25	0.75	3.38	0.7021	4.4232	5.1253
Long Facades	14.98	3.62	18.6	0.2896	0.25	0.75	6.68	7.2448	5.2522	12.4970
Roof	8.00	6.40	14.4	0.2540	0.25	0.75	16.88	8.5750	20.5801	29.1551

Total Area of Glazed Area & Opaque Area (m^2)	Total Heat Gain of Glazed Area & Opaque Area (W)
66.48	252.9513

OVERALL THERMAL TRANSFER VALUE
= TOTAL HEAT GAIN / TOTAL AREA
= 252.9513 / 66.48
= 3.80 W/m^2 OK (to meet local authority requirement)

Heat Gain Calculation (ii)

SITUATION A: GLAZED AREA FACING NORTH WITH HORIZONTALL SHADING DEVICE

Description	Glazed Area (m²)	SC	ESM	SF	Heat Gain (W)
Glazed Facades	6	0.3	0.781	104	146.2032

Description	Opaque Area (m²)			U value (W/m² °C)	α		TD_{EQ} (°C)	Heat Gain (W)		
	Fixed Part	Movable part	Total		Fixed Part	Movable part		Fixed Part	Movable part	Total
Glazed Facades	8.98	3.62	12.6	0.2896	0.25	0.75	3.38	2.1975	2.6576	4.8551
Short Facades (A)	2.40	5.04	7.44	0.3462	0.25	0.75	6.68	1.3876	8.7417	10.1293
Short Facades (B)	2.40	5.04	7.44	0.3462	0.25	0.75	5.79	1.2027	7.5770	8.7797
Long Facades	14.98	3.62	18.6	0.2896	0.25	0.75	5.01	5.4336	3.9392	9.3728
Roof	8.00	6.40	14.4	0.2540	0.25	0.75	16.88	8.5750	20.5801	29.1551

Total Area of Glazed Area & Opaque Area (m²)	Total Heat Gain of Glazed Area & Opaque Area (W)
66.48	208.4952

OVERALL THERMAL TRANSFER VALUE
= TOTAL HEAT GAIN / TOTAL AREA
= 208.4952 / 66.48
= 3.14 W/m² OK (to meet local authority requirement

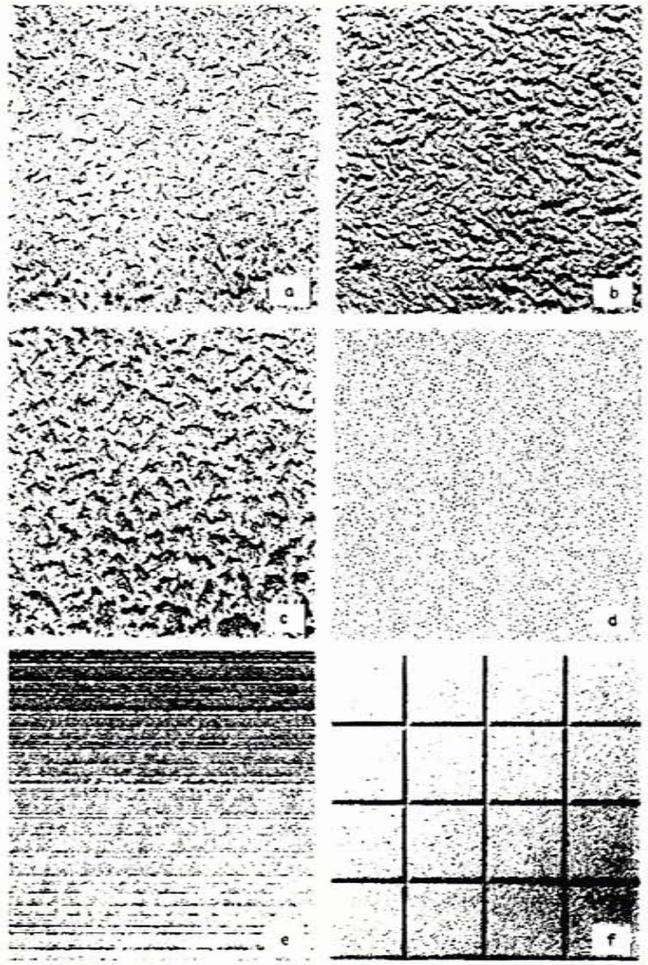
7.3 ACOUSTIC PERFORMANCE

7.3.1 SOUND ABSORPTION

The reverberation time of a room depends on the volume, surface, and the acoustic characteristics of the materials. The total acoustic absorption depends on absorption coefficient as well as the surface area of the materials.

Some of the Sound Absorption Coefficients are listed as below:

Materials	Sound Absorption Coefficients, (HZ) 125	500	2000
Perforated Steel Panel backed by 50mm layer of 2 pcf OCF Type RA-23 Fiberglass	0.31	1.19	1.07
Silicate-treated Wood Fiber, Organic Binder Panel	0.06	0.24	0.82
Semi rigid 'Acoustic' Insulation Board on solid backing	0.15	0.80	0.80
Perforated Metal Ceiling Panel backed with fibreglass	0.63	0.80	1.03
Plastic Floor	0.02	0.05	0.10
Carpet (Loop pile tufted carpet, 0.7Kg/m^2 with 1.4Kg/m^2 hair pad)	0.10	0.35	0.69
Typical Glazing Unit	0.18	0.04	0.02
People in padded seats	0.15	0.45	0.45



ABSORPTION SURFACE TEXTURE

7.3.2 REVERBERATION TIME

The Sabine's Original Formula explains the factors affecting Reverberation Time.

SABINE'S ORIGINAL FORMULA
RT = 0.16 X VOLUME / TOTAL ABSORPTION

REVERBERATION TIME CALCULATION

TOTAL ABSORPTION
= ABSORPTION OF CEILING + ABSORPTION OF FLOOR + ABSORPTION OF WALLS + ABSORPTION OF GLAZING + ABSORPTION OF PEOPLE

(Take 125Hz for calculation and 2 persons inside, the highlight materials are finally chosen.)

TOTAL ABSORPTION
=(6 x 2.4 x 0.06) + (6 x 2.4 x 0.02) + (2.8 x 2.4 x 0.06) x 2 + (6 x 2.8 x 0.06) x 1.5 + (3 x 2.8 x 0.18) + (2 x 0.15) x 2
=0.864 + 0.288 + 0.8064 +1.512 + 1.512+ 0.6
=5.5824

REVERBERATION TIME
RT = 0.16 X VOLUME / TOTAL ABSORPTION
RT = 0.16 X (2.8 X 6 X 2.4) / 5.5824
RT = 1.16s

(Take 500Hz for calculation and 2 persons inside, the highlight materials are finally chosen.)

TOTAL ABSORPTION
=(6 x 2.4 x 0.24) + (6 x 2.4 x 0.05) + (2.8 x 2.4 x 0.24) x 2 + (6 x 2.8 x 0.24) x 1.5 + (3 x 2.8 x 0.04) + (2 x 0.45) x 2
=3.456 + 0.72 + 3.2256 + 6.048 + 0.336+ 1.8
=15.5856

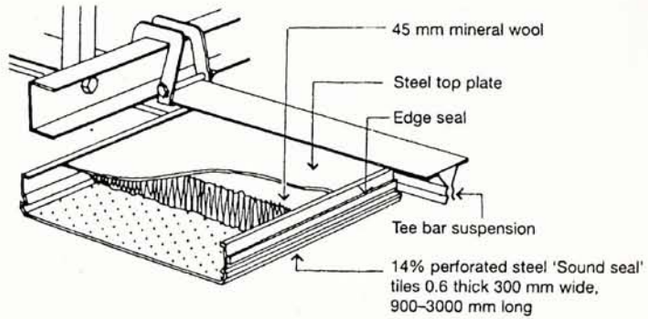
REVERBERATION TIME
RT = 0.16 X VOLUME / TOTAL ABSORPTION
RT = 0.16 X (2.8 X 6 X 2.4) / 15.5856
RT = 0.41s

(Take 2000Hz for calculation and 2 persons inside, the highlight materials are finally chosen.)

TOTAL ABSORPTION
=(6 x 2.4 x 0.82) + (6 x 2.4 x 0.10) + (2.8 x 2.4 x 0.82) x 2 + (6 x 2.8 x 0.82) x 1.5 + (3 x 2.8 x 0.02) + (2 x 0.45) x 2
=11.808 +1.44 + 11.0208 + 20.664 + 0.168+ 1.8
=46.9008

REVERBERATION TIME
RT = 0.16 X VOLUME / TOTAL ABSORPTION
RT = 0.16 X (2.8 X 6 X 2.4) / 46.9008
RT = 0.14s

The reverberation time for the design is between 0.14 to 1.16s, which is acceptable for the broadcasting studio



ACOUSTIC CEILING

Sound absorption is important in room acoustics

7.33 NOISE CRITERIA

The noise criteria to be achieved for a broadcasting studio is at most 25dB. Assuming a normal busy street is 60dB, The envelope, therefore, needs to reduce 35dB noise from the outside.

TRANSMISSION LOSS (TL)

Transmission Loss is a measure of the airborne sound insulation, expressed in decibels (dB), provided by a partition. It increases with frequency. The higher number of Transmission Loss, or Sound Transmission Class (STC), means a better sound insulation.

Some of the Transmission Loss of the Glazing is list as follows:

Materials	Transmission Loss, (dB)			
	STC	125	500	2000
Anneal Glass (6mm glass)	**31**	25	31	30
Laminated Glass (6mm glass, 0.75mm plastic, 6mm glass)	**38**	29	36	41
Double Glazing (3mm glass, 100mm air, 3mm glass)	**42**	25	41	49
Double Glazing (13mm laminated glass, 100mm air, 5mm glass; unseal, operable)	**49**	37	49	53

From the above table, the double glazing generally has a better acoustic insulation than a single glazing. And Laminated glass has a better acoustic insulation than anneal glass.

In the final design, double-glazing with a 13mm laminated glass (STC 49) is chosen for acoustic reasons. Another glass is a low-e glass for reducing the solar heat gain.

As a result, the noise criteria can be achieved by the acoustic glazing design is 16dB, which can be considered as an excellent broadcasting environment.

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