

NANOTEC RESEARCH CENTER & EXHIBITION

JATURUN SAKTWEKULKIT

A THESIS SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

BACHELOR OF ARCHITECTURE

DEPARTMENT OF INTERIOR ARCHITECTURE, SCHOOL OF ARCHITECTURE
ASSUMPTION UNIVERSITY

2005

Nanotec Research Center & Exhibition

Jaturun Saktwekulkit

A thesis Submitted impartial
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Bachelor of Architecture



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2005



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Date A. Vacharat Samakkamai , Chairperson

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Nanotec Research Center & Exhibition

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74 pg.

March 2005

In present time Technology is one part of human's life. Nanotechnology is new technology that will be take future of world's economic. Thailand have to prepare and develop human resoure for competition with another country in economic world

Nanotec Sesearch Center & Exhibition is a new project that can give knowledge for people and help thailand economic in future

We can use Nano science for solve problem of polution nanotechnology is technology for our future



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Thank you: my Parent for understanding and kindness in 7 Year.....

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Nummon for room space

Op for 3D Knowledge

Nor for 3D knowledge

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I

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Chapter 1

Project: *Nanotec education center*

Resercher: Mr.Jaturun Saktwekulkit

History and background

Nanotechnology was known in Thailand for a few years and it was more influent about economic and ordinary life style in next step. Nanotechnology is science that link with synthesize material or product by manipulation matter atom, where mersures must be made in nanometer (*a nanometers is one billionth of a metter, only three or five atom wide*) that make construcktion of material to be a special qualities.

In 1991, NSTDA (National Science and Technology Development Agency) were eatablishing follow in act of legislation about science and technology development. This association composed 3 of organization Biotec(1983), Mtec(1986), Nectec(1986). First ,National Science and Technology developmemt Agency was locade at Eakemai Rd. before moving to Science Park at 111 Science Park, Phahonyothin Rd, Kronglaung.

In 2003, *Nanotec Thailand* was added in to NSTDA and use a part of Nectec building for temperary proceeding.

USA, Japan and other highly innovative countries have all interest into Nanoscience. Nanoscience and technology in Japan start in 1992 and USA start in 1994

Reason for study this topic

Nanotechnology is believed to be one of the mainstream industries in the 21 century. The applications of nanotechnology has created many new developments and products, and has expanded its use to influence industries and fields such as aviations, laboratory, materials, mechanics, electronics, biotechnology, military and many thing in our dailly life (who own nanotechnology they own world's economic in 21 century)

Problem and solving

This organize have to expend or move in to another building because of

- Now Nanotec use nectec building for temporary.
- Have to increase human factor.
- Nanotechnology is very important for economic and human life style. and nanotecnology in Thailand was in a step of developing then this organization must have attractive space to attract people, student, capitalist and business owner to make an invesment and support education for develop thailand's human factor.

The objective of study

Objective of project

- To be a center for research and developing nanotechnology.
- Expand knowledge about nanoscience in our life to student, children and attractive people who want to understand about nanotec.
- To educate and develop structure of human resource.
- Link to support between institute, university, industrial and international organization.
- For support capitalist and business owner to investment.

Objective of study

- To understand the organization system of nanoscience center.
- To realize the functional of education center.
- To understand the user behavior of science center and science museum.
- To understand the system of laboratory and cleanroom.

Scope of research

- Administration area
- Event zone
- Exhibition area
- Library
- Laboratory, Clean room
- Technical system
- Functional system
- User behavior
- Nanoscience and technology

Scope of project

Public space

- Completing design in general public space
 - Entrance & reception
 - Souvenir
 - W.C.
 - Refreshment

Exhibition

- Completing design in exhibition.
 - Permanent
 - Temporary
 - Exhibit the special information, new situation and any festivals.
 - Circulation for visitor to service laboratory

Education

-Completing design in Library.

- Auditorium
- Library

Administration

Space planning

- Office
- Laboratory
- Exhibition and technique
- Education department



Chapter 2

Case study

National Center for Genetic Engineering and Biotechnology (BIOTEC)

Owner : National Science and Technology Development Agency (NSTDA)

Location : 111 Paholyothin Road, Klong Luang,
Pathumthani, 12120, Thailand

Area : 14,000 SQM

Completion : 2000



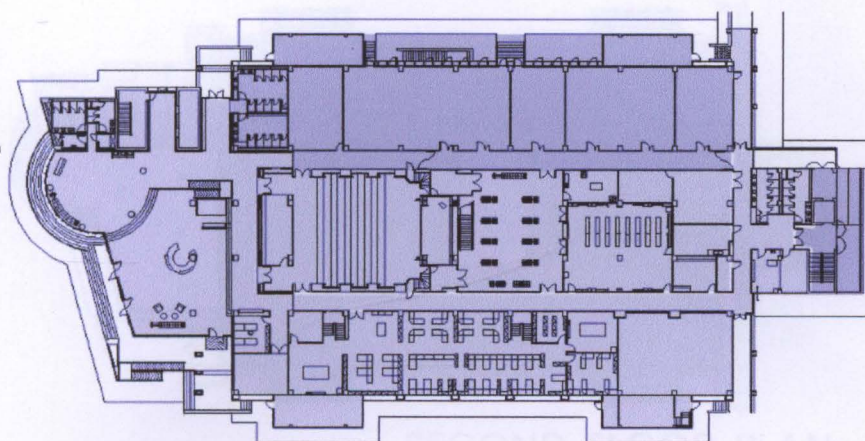
History of BIOTEC

In 1991, NSTDA (National Science and Technology Development Agency) were establishing follow in act of legislation about science and technology development. This association composed 3 of organization MTEC, NECTEC and BIOTEC.

National Center for Genetic Engineering and Biotechnology (Biotec). Biotec has situation as free organization for comfortable and easy to be a center for research and developping about engineering biotechnology. To be a center for give knowledge and information people. And guide people to use technology for better life.

Objective of the BIOTEC

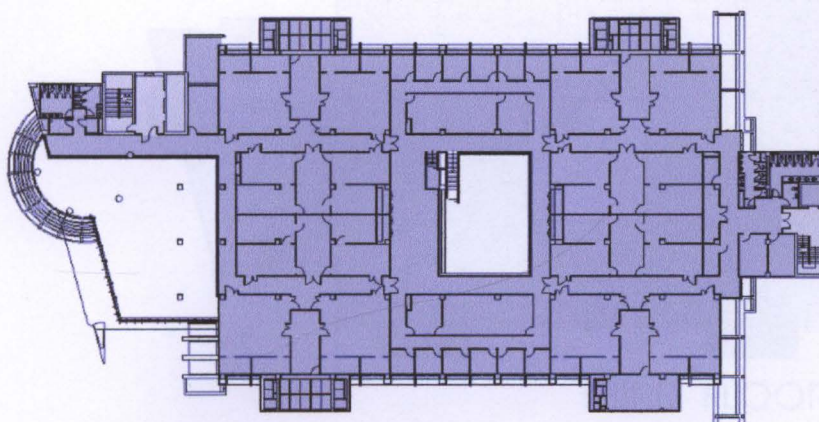
1. Develop quality about biotechnology and bioscience for country.
2. Supported development human resaurce in technology, And make people understand about technology.
3. to motivating and encouraging to Thai people to interest in science which is important to develop the country, and promote the new vision of science and technology to people.
4. Link to support between institute , university, industrial and international organization.
5. For support capitalist and business owner to investment.



FIRST FLOOR PLAN

Ground level plan

- reception & information
- Coffee shop & refreshment
- 1. Deputy director
- 2. Senior director of cooperate image division
- 3. business development and biolaw division
- 4. Food safety services unit (GMP)
- 5. Technological services for rural development unit
- 6. Public relations section
- 7. Training section
- 8. Food science and technology assositation for thailand
- 9. Administrative section
- 10. Biotec auditorium
- 11. Biotec seminar room 1
- 12. Biotec seminar room 2



SECOND FLOOR PLAN

Second level plan

1. Director of Reserch Divition
2. Faclity management section
3. Safety and environment section
4. Administration : Reserch divition
5. Procurement : Reserch divition

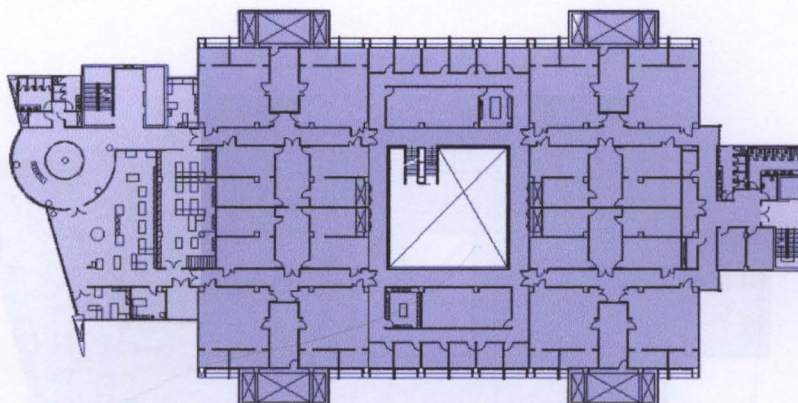
Reserch Laboratory

6. Ecology laboratory
7. Phylogenetics laboratory
8. Food biotec laboratory
9. Plant biotec laboratory
10. Equipment services section



SINCE 1969

มหาวิทยาลัยอัสสัมชัญ



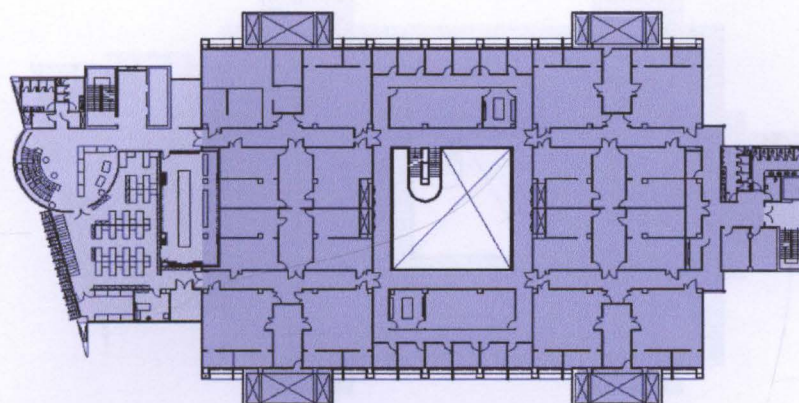
THIRD FLOOR PLAN

Third level plan

1. Assistant director
2. Director of management division
3. Biotechnology policy study unit
4. Human resource management section
5. Human resource development section
6. Finance and Accounting section

Reserch Laboratory

7. Microbial culture collection
8. Central equipment room
9. Microbial engineering laboratory
10. Anti tuberculous drug research laboratory
11. Animal cell biotechnology 1
12. Animal cell biotechnology 2
13. Computer training room



FORTH FLOOR PLAN

Forth level plan

1. Deputy director
2. Research development and engineering promotion division
3. Management information systems section
4. Computer services section
5. Meeting room

Research Laboratory

6. Bioinformatic laboratory
7. Protein – ligand engineering and molecular biology laboratory

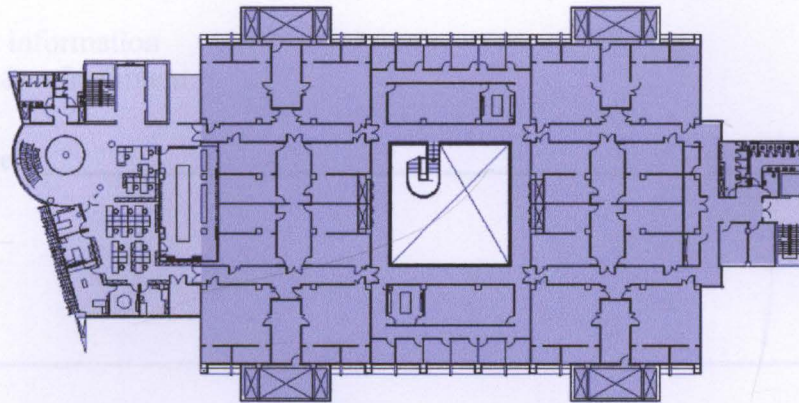
9. Fermentation technology laboratory

10. Microorganism cultivation research laboratory

11. Control equipment team

12. Mycology laboratory

13. Bioresources research laboratory



FIFTH FLOOR PLAN

Fifth level plan

1. Director
2. Specialist
3. Senior Advisor
4. Executive secretary section
5. Planning, monitoring and evaluation section
6. Budgeting section
7. International relations section
8. Board meeting room

Research laboratory

9. fermentation technology laboratory
10. Mushroom cultivation research laboratory
11. Central equipment room
12. Mycology laboratory
13. bioresources research laboratory

Public area _____ **5%**

- Reception & information
- Coffee shop & refreshment

Laboratory area _____ **60%**

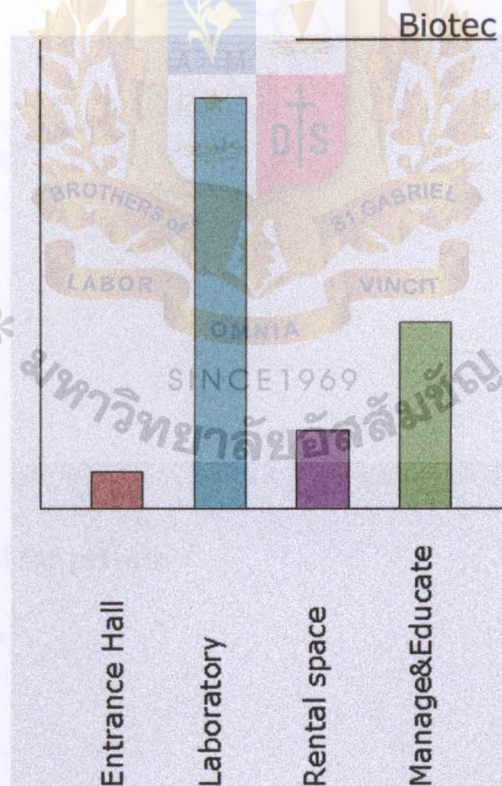
- laboratory
- bedroom

Area for rent _____ **10%**

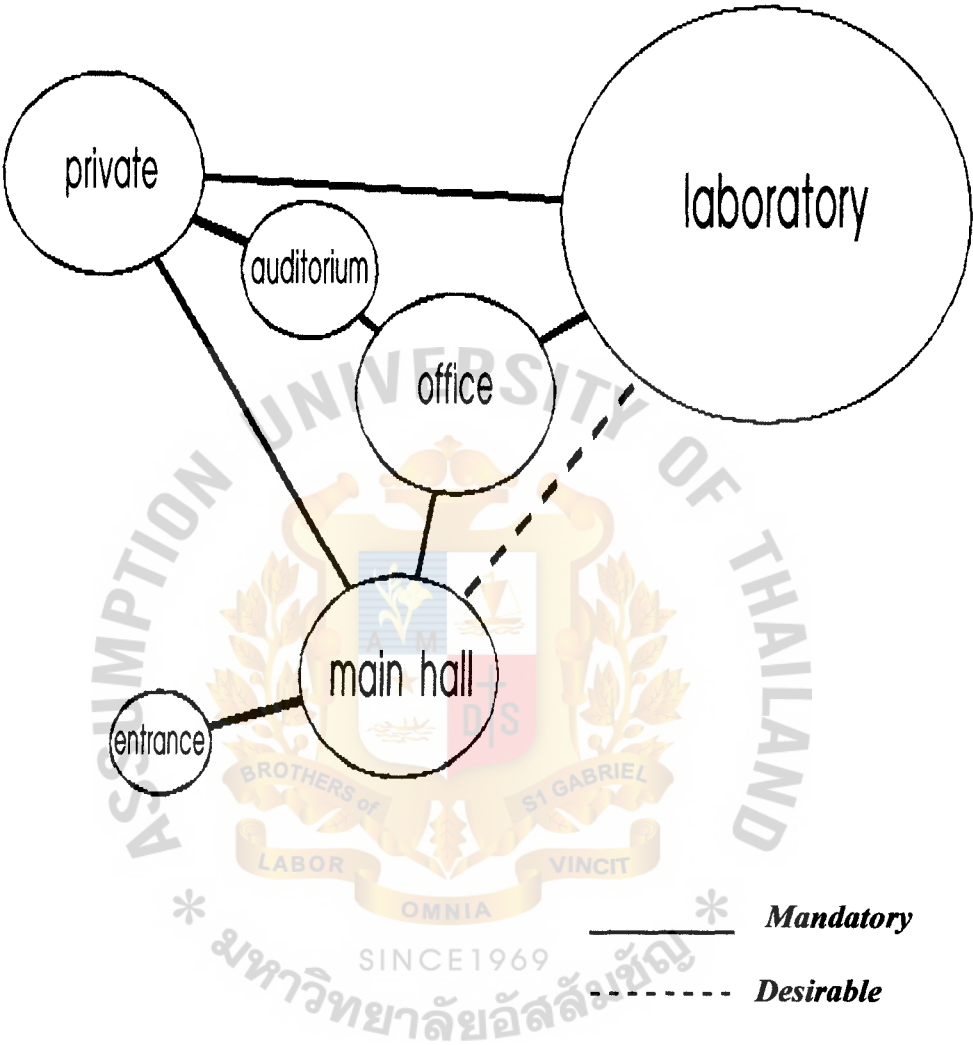
- private company

Office area _____ **25%**

- Office



Buble Diagram



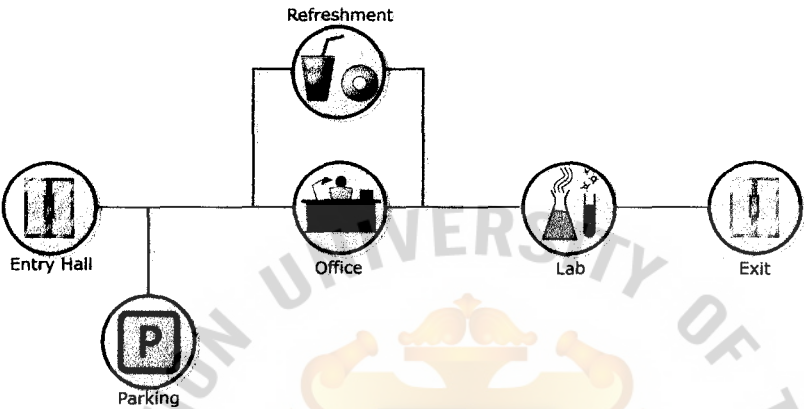
- Main hall
- Space rental for private
- Office
- Auditorium
- Laboratory

User Group

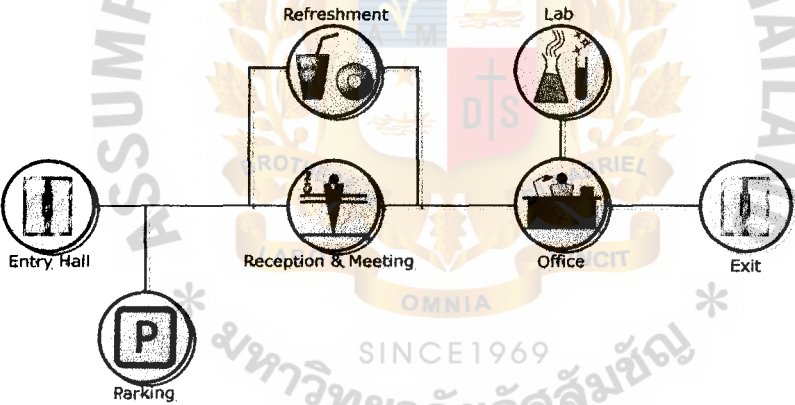
- Scientist
- Stuff
- Rental

User Behavior

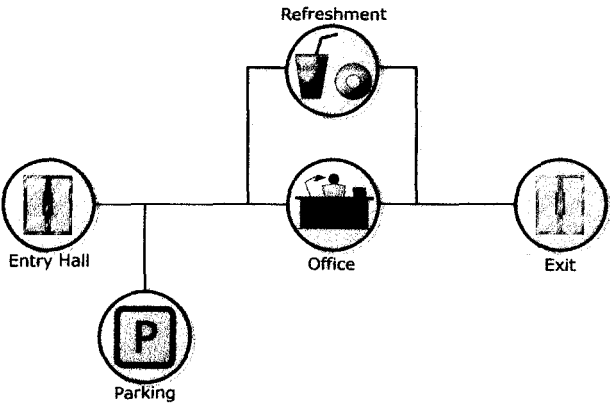
Scientist



Rental



Staff



London Centre for Nanotechnology

Owner : University College London

Location : Gower Street, London WC1E 6BT United Kingdom
T: 020-7679-1308

Area : 3,200 SQM

Completion : February 2003



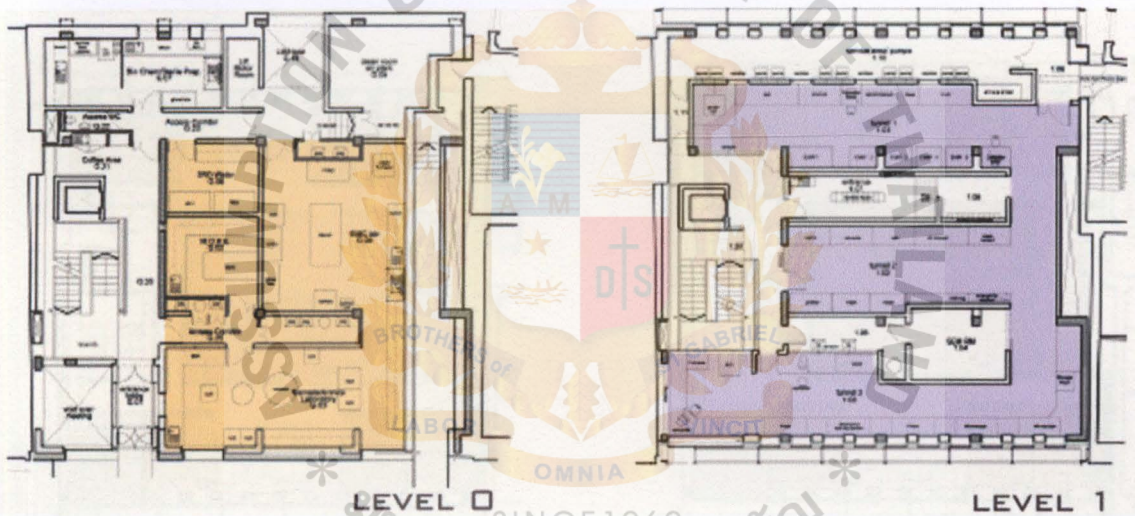
History The London Centre for Nanotechnology (LCN)

Is designed to focus effort and to capitalise on interdisciplinary expertise in nanoscale materials and device research. The LCN is a joint enterprise between two of the world's leading institutions in the area: University College London and Imperial College London. The Centre will be housed in a new building offering eight levels of laboratory and office space for ca. 100 professionals from the physical and life sciences, medicine and engineering. Key infrastructure is to include state-of-the-art design, fabrication and characterisation tools centred around a 200 m² clean room facility. Building will commence in February 2003 and take approximately 65 weeks. However the research activities are already well established, but span several locations. The budget for the building is ca. £12.5 million. Pertinently, this will be the only such facility in the world located in the middle of a metropolis, with superb access to corporate partners and venture capitalists, and with opportunities to spin out companies arising from the intellectual property generated by the research of the Centre.

Ground Floor (level 0)

Entrance and specialised laboratory suites for biological and physical sciences.

Secure entry off Gordon Street leading to the central circulation area comprising lift, corridor and stairs, which has been designed to maximise informal interactions amongst occupants. Specialist laboratories on this level include those focused on the electronic and magnetic characterisation of nanomaterials.



Level 1

Full-width, full-depth Clean Room (200 m*m) for ultra-high purity fabrication.

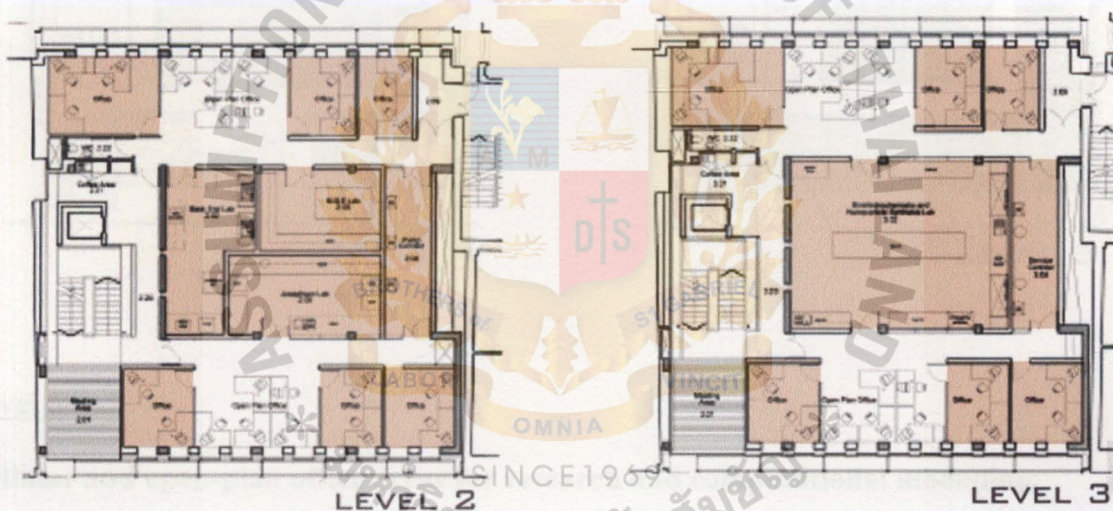
The Clean Room (rated as Class 100 to Class 1000) and service areas occupy the whole floor plate, 17 m by 20 m. This is an environmentally controlled area in which dust and other air-borne contaminants are minimised. The ultra-clean conditions that are maintained allow the precision fabrication and characterisation of nanostructured devices.

Level 2,3 & 4

Central laboratory spaces with perimeter cellular and open-plan office areas.

LEVEL 2

This floor comprises a central core of laboratories and a perimeter suite of cellular and open plan offices, a template that is copied on Levels 3 and 4. Two of the laboratories on this level are specifically for the growth (by molecular beam epitaxy) and characterisation of samples for the Clean Room, while a third contains specialist equipment for studying superconducting materials and devices.



LEVEL 3

The central laboratory on this floor is a large, highly flexible (reconfigurable) space suitable for a broad range of biological and chemical syntheses.

LEVEL 4

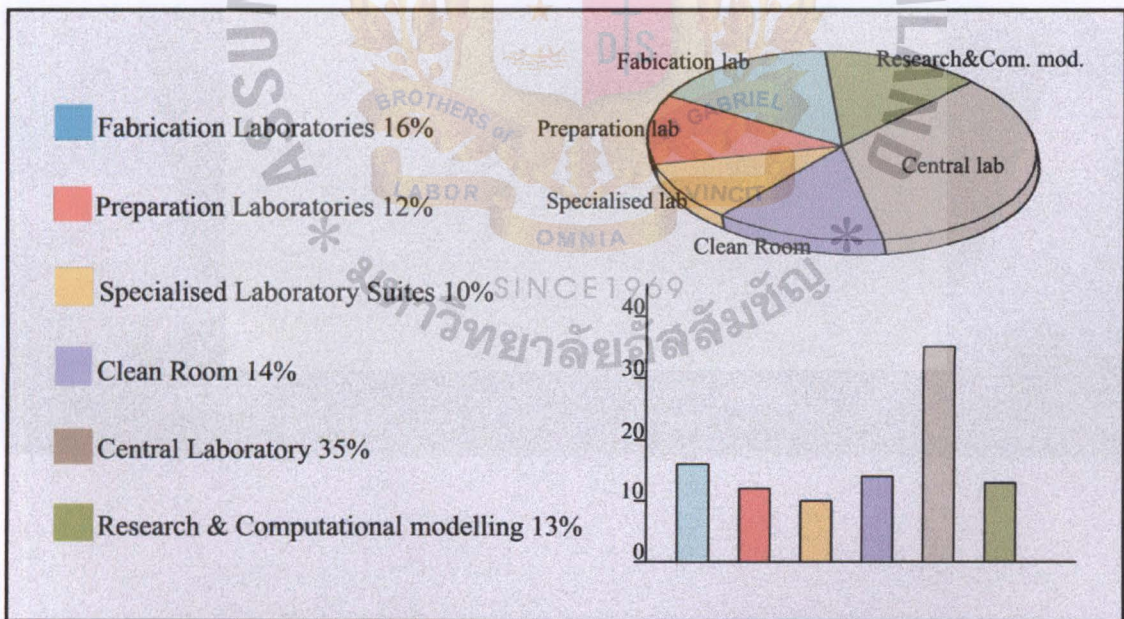
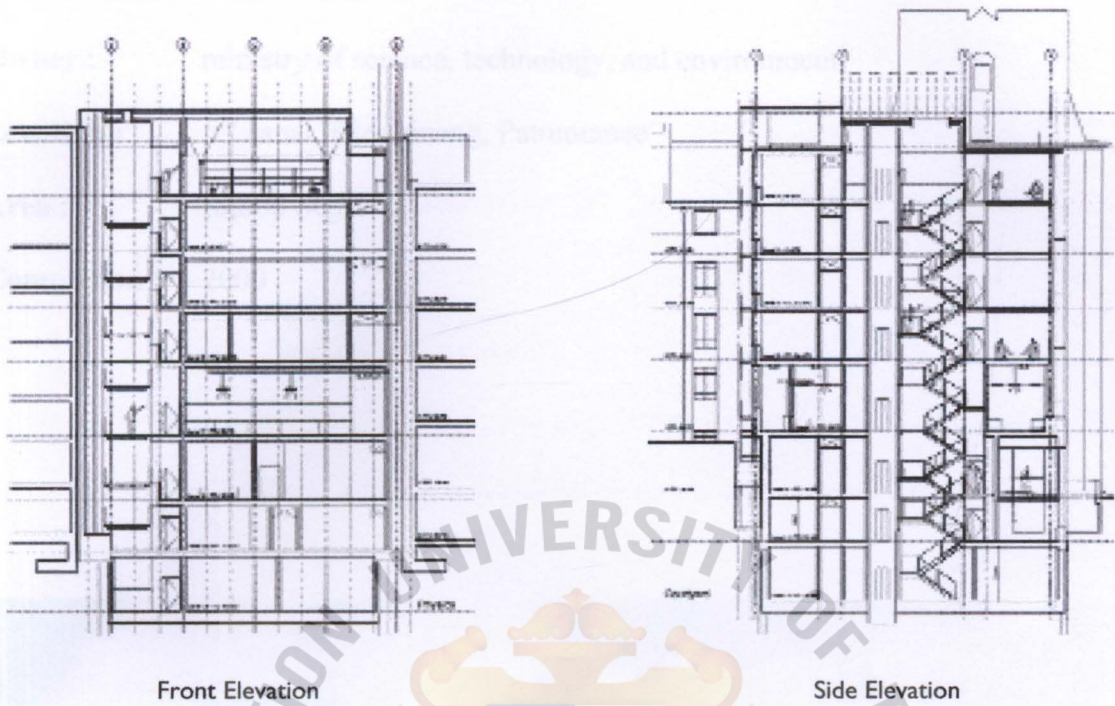
The two laboratories forming the core of this level are dedicated to novel materials and device research using unconventional manufacturing processes. These include the growth and use of diamond-like carbon, and the production of devices via ultra-violet light irradiation and pulsed-laser deposition.



Level 5

Cellular and open-plan office areas for research and computational modelling.

The focal point for the theoretical and computational aspects of the Centre's research activities, this level is entirely comprised of a mixture of cellular and open-plan offices, and meeting areas.



National Science Museum

Owner : ministry of science, technology, and environment

Location : 5th canal, Klongluang, Patumtanee

Area : 18,000 SQM

Completion : 2000



History of National Science Museum (NSM)

On the auspicious of the 60th of Her Majesty The Queen at august,12, 1992. The government by science, technology, and environment ministry has initialed the national science museum project. The museum is aimed to be lace for commemoration of the Queen's work on the science and technology to increase the quality of people life, to reform the nature and environment, including arts and culture of Thailand. The project started in 1992 and in 1995 the government established national science museum (NSM) in the control of science, technology and environment ministry, it purpose for manage the museum.

Duty and role of antional science museum under the control of science tectnology and environment ministry is the equipment of the government and to providing and increase the understanding in science and technology which related with economic, social, and environmental. To be the direction of development the country in the way of information technology.

Objective of the national science museum

6. to present the relationship between thai's Queen and science technology
7. to exhibit the history of Thai science from the past to present.
8. to motivating and encouraging to Thai people to interest in science which is important to develop the country, and promote the new vision of science and technology to the children.
9. to be the center of knowledge in science and technology from boat public and private sectors as a " one stop service"

Management direction

The management in NSM divide in to 4 part

2. information and object collection including research, experimental of science which is concern to exhibition for the public
3. exhibition and presentation in the temporary and permanent exhibition for example : garphic, document, CD-ROM, seminar and presenter.
4. financial supports for building, facility and exhibition maintenance, inculding margeting and business development.
5. management and business administration system to define the organization image, to improve and promote to be a part of the social. Opened for the private individual.

User and activity

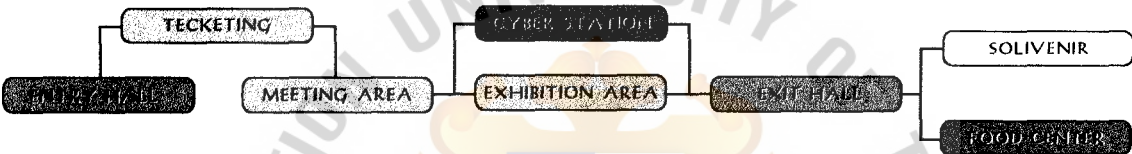
1. users target
 - group of children
 - group of worker
 - group of expert and experimentalist
 - group of tourist
 - group of people
2. technique target to be the center of knowledge in science and technology. Be the center of continental exhibition for science and technology.
3. to motivating and encouraging to thai people to interest in science which is important to develop the country, and promote the new vision of science and technology to the children.

User behavior

STUDENTS



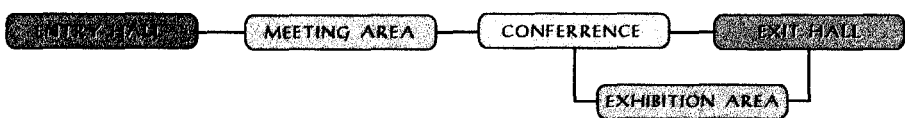
TOURISTS



GENERAL VISITOR



ORGANIZATION



Ground level plan



Fig. 3.3.4 (NSM ground level)

Ground level plan

Reception and introduction area

1. Ticketing and information
2. Science museum background
exhibit the history of the museum including concept of the building
3. Meeting point (show the museum model)
4. Cyber station
5. Clock room (service station)
6. Pioneers of science
7. Temporary exhibition hall 1
8. Temporary exhibition hall 2 (approximately area : 1,000 SQM)
9. Museum souvenir shop
10. NSM head office

Ground level plan

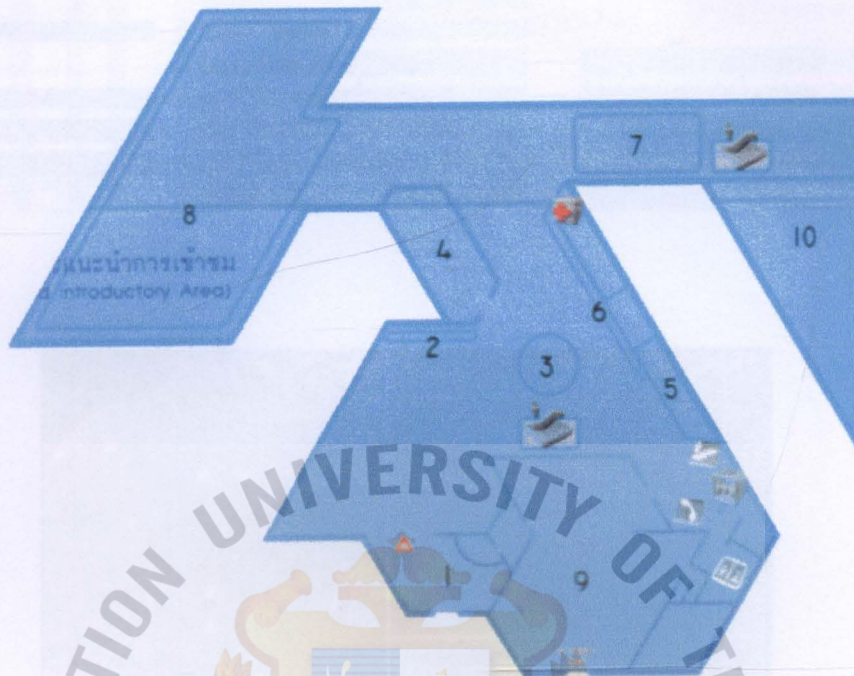
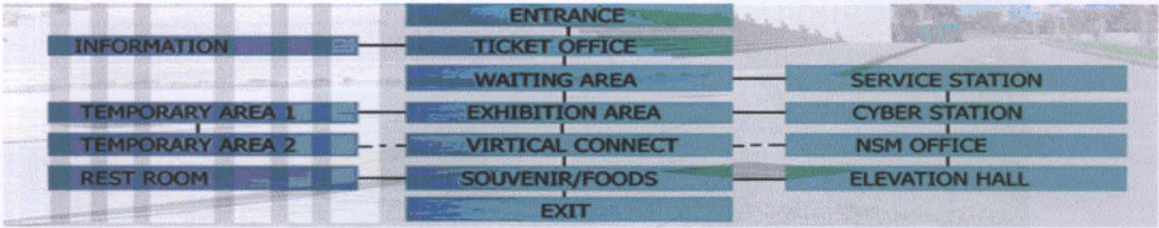


Fig. 3.3.4 (NSM ground level)

Ground level plan

Reception and introduction area

1. Ticketing and information
2. Science museum background exhibit the history of the museum including concept of the building
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5. Clock room (service station)
6. Pioneers of science
7. Temporary exhibition hall 1
8. Temporary exhibition hall 2 (approximately area : 1,000 SQM)
9. Museum souvenir shop
10. NSM head office



Second level plan

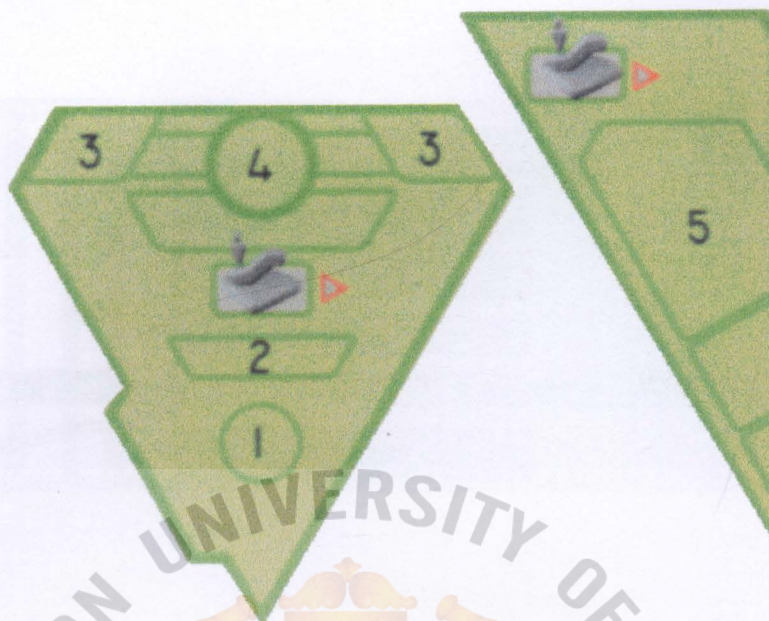


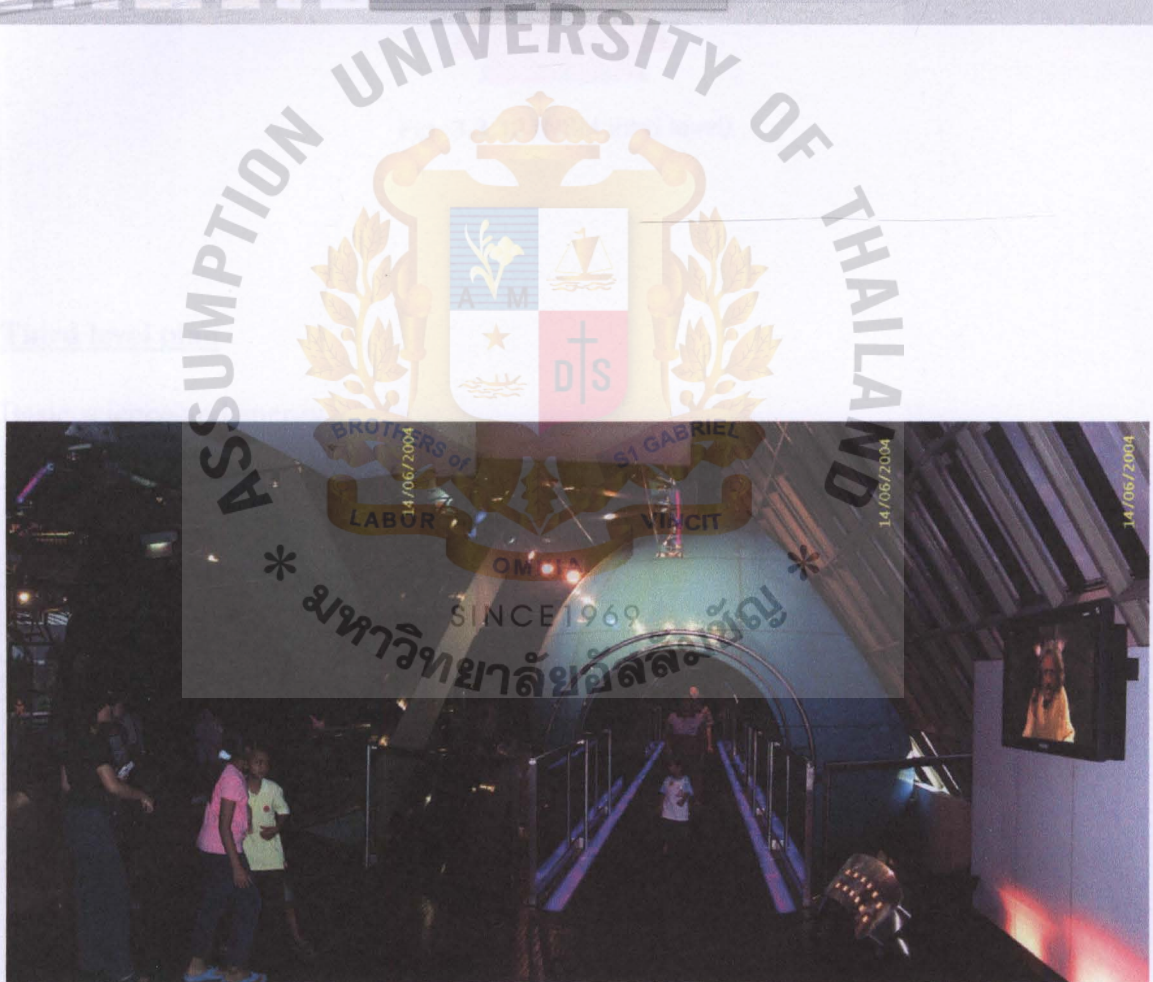
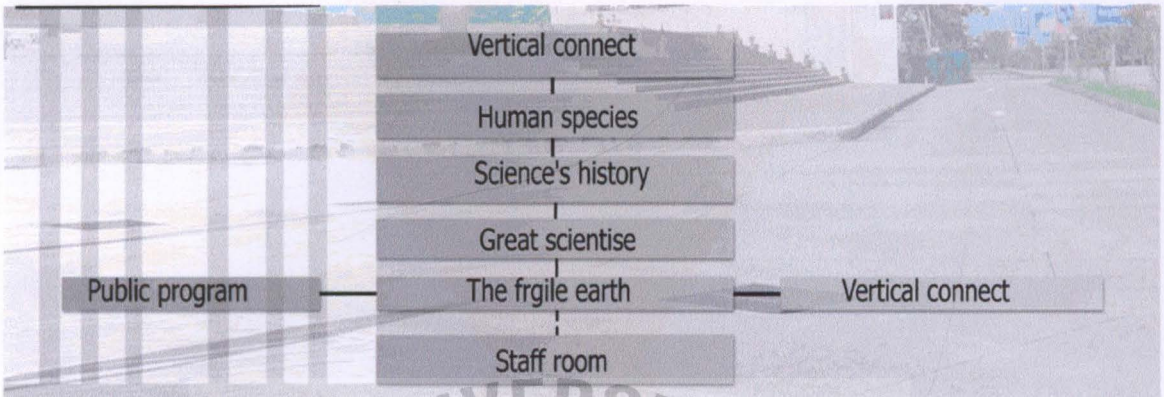
Fig. 3.3.8 (NSM second level)

Second plan

History of science and technology

1. The origin of human species and the development of science. Exhibition fossil of human for 3.5 millions years ago and idea of Leonardo Da Vinci.
2. History of science.
Exhibition the innovated and experimented from the past till present and trend to the future divided into 5 groups following.
 - Innovation of communication and alphabet
 - Energy from the nature such as wind, human and applied to use in daily life.
 - The earth and space.
 - Substance refers to molecules and chemical compounds
 - Life and revolution of life refers to chromosome and DNA
3. Vision of the great scientists
Present the great theories of 6 scientists.
4. The fragile earth
Our planet, natural resources and science
5. Public program area.

Thema: World plan



Third level plan

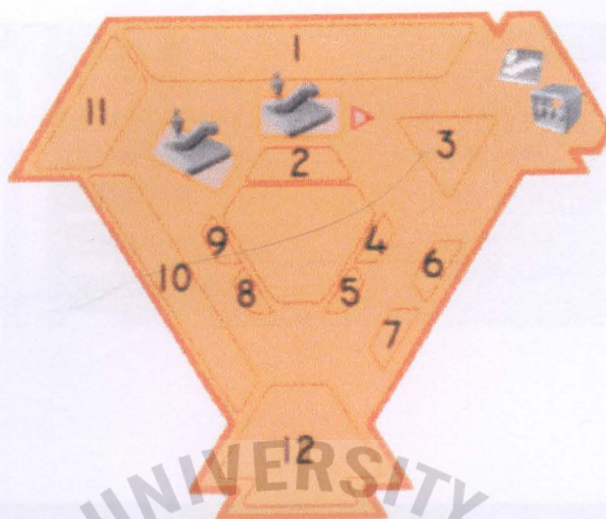
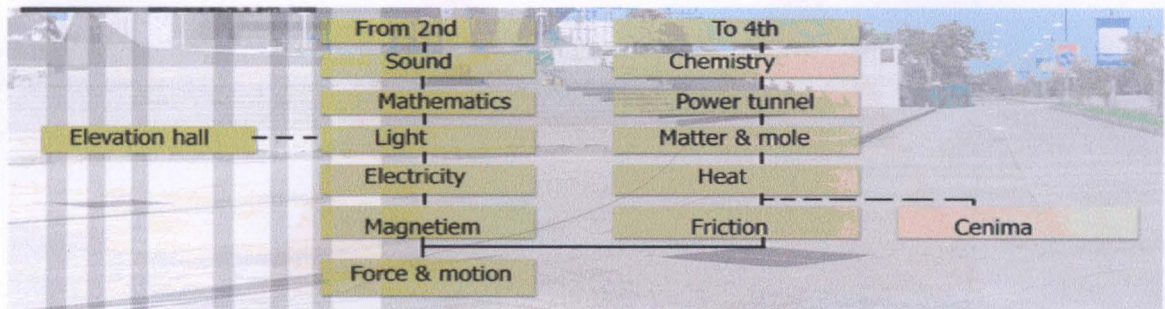


Fig. 3.3.12 (NSM third level)

Third level plan

Basic science and energy

14. Sound.
15. Mathematics.
16. Light.
17. Electricity.
18. Magnetism.
19. Force and motion.
20. Friction.
21. Heat.
22. Matter and molecules.
23. Power tunnel.
24. Chemistry.
25. Cinema : multimedia projector room project the story about energy in everyday life.



Fourth level plan

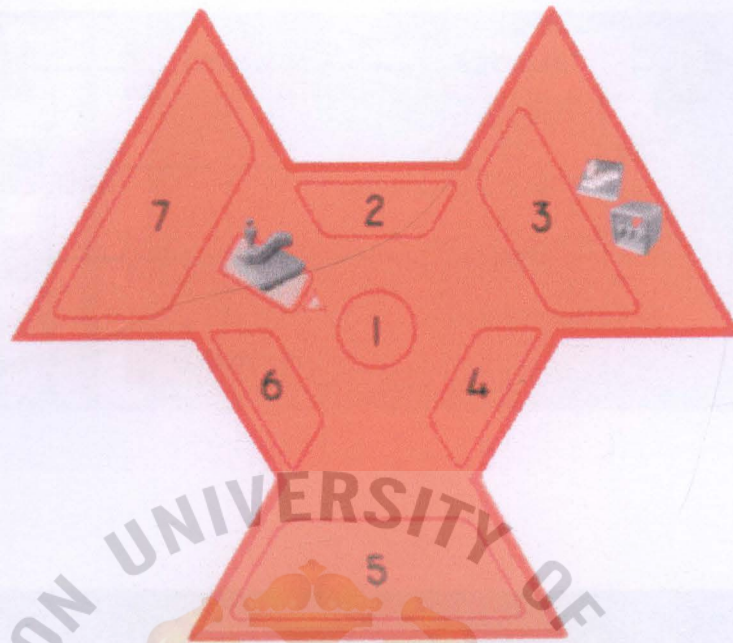


Fig. 3.3.16 (NSM fourth level)

Forth level plan

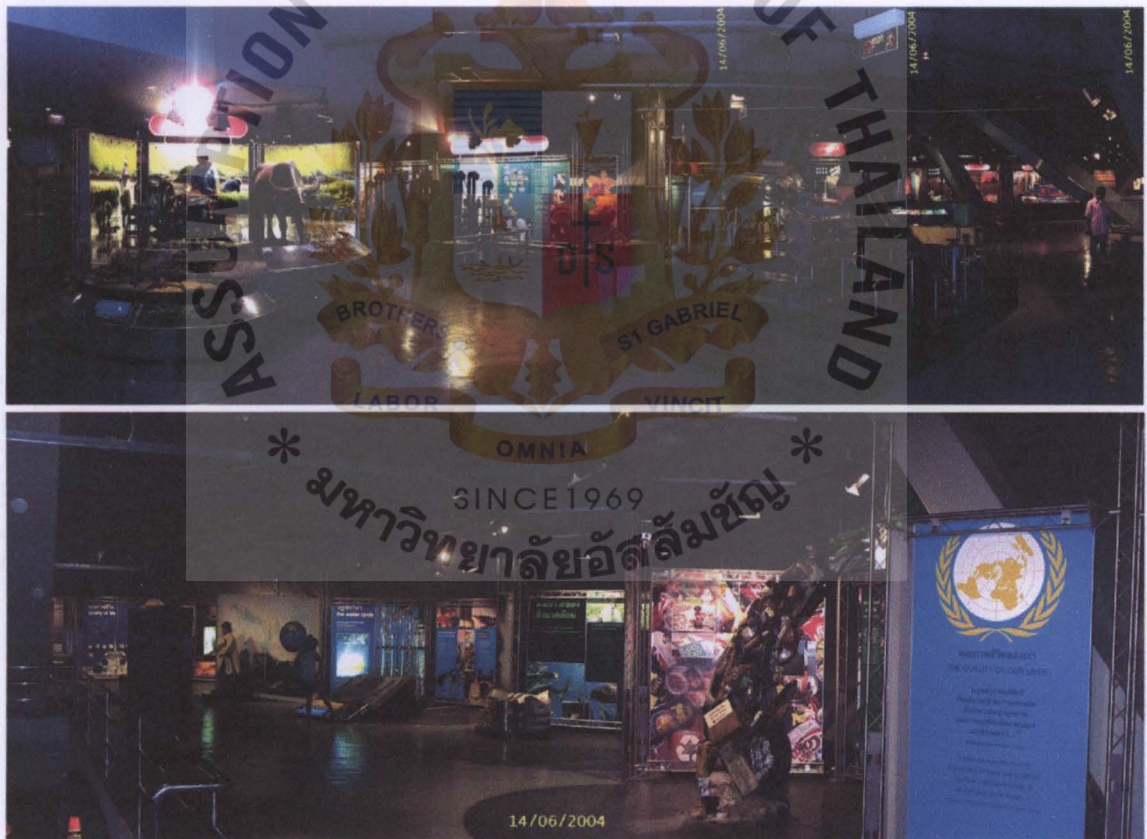
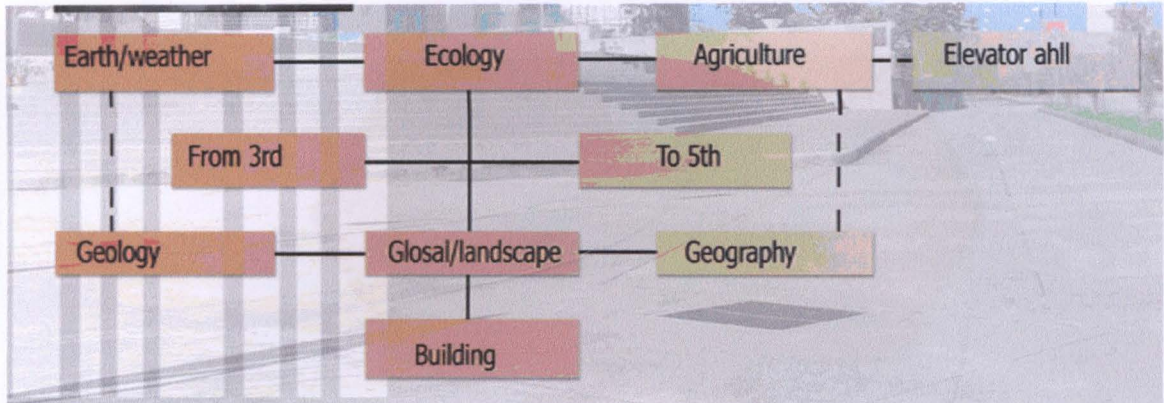
Science and technology in thailand

7. Groble setting and landscape of thailand.
8. the ecology of Thailand.
9. Agriculture and industrialization.
10. The geography of Thailand.
11. Building and structure.
12. The geology of Thailand.

Exhibition the geology condition in Thailand
consist the following topics :

- geology area in thailand
- Thai fossils
- Valuable minerals and rocks

13. The earth and weather.



Fifth level plan

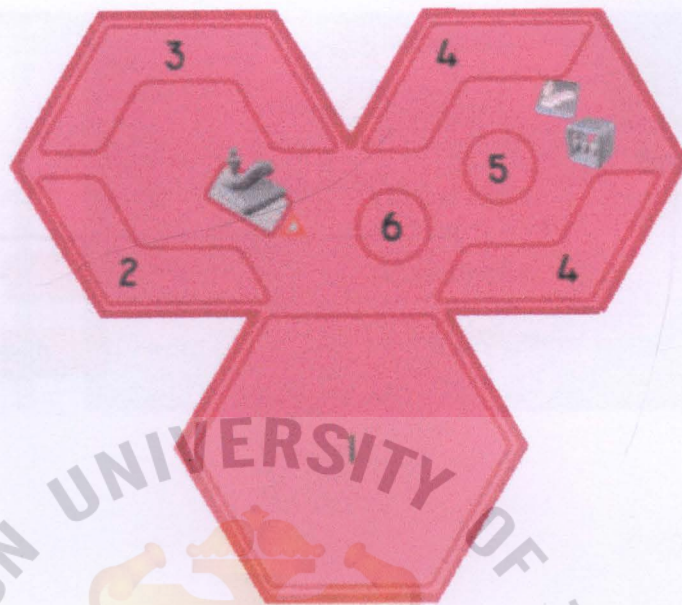


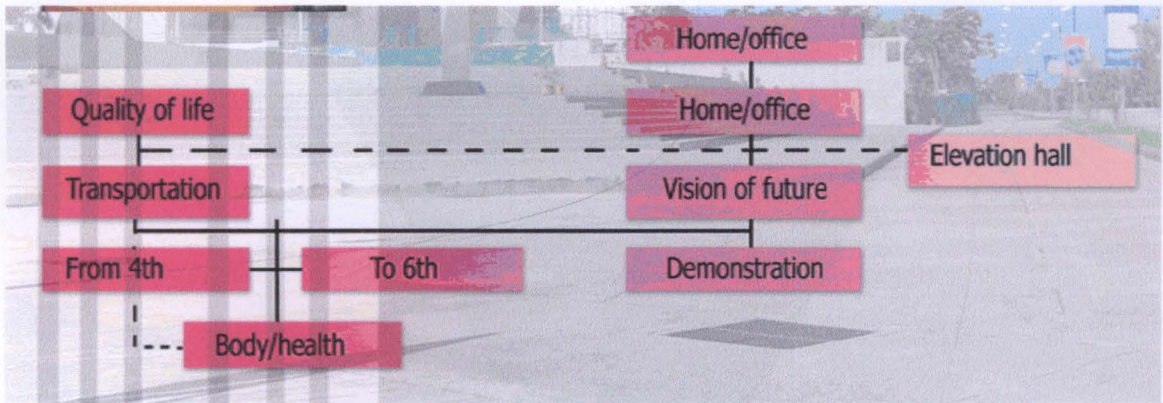
Fig. 3.3.20 (NSM fifth level)

Fifth level plan

Science and technology in everyday life

1. Body and health
2. Transpotation
3. Home and office
4. Vision for the future
5. Demonstration

Fourth level plan



Sixth level plan

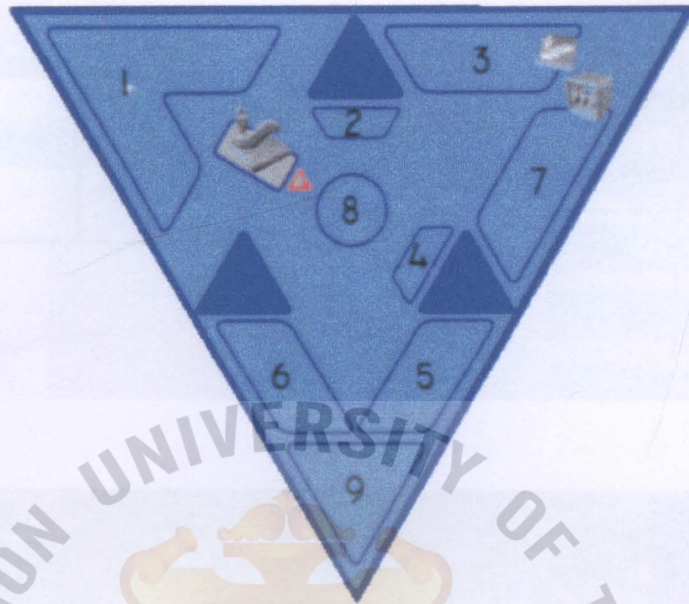
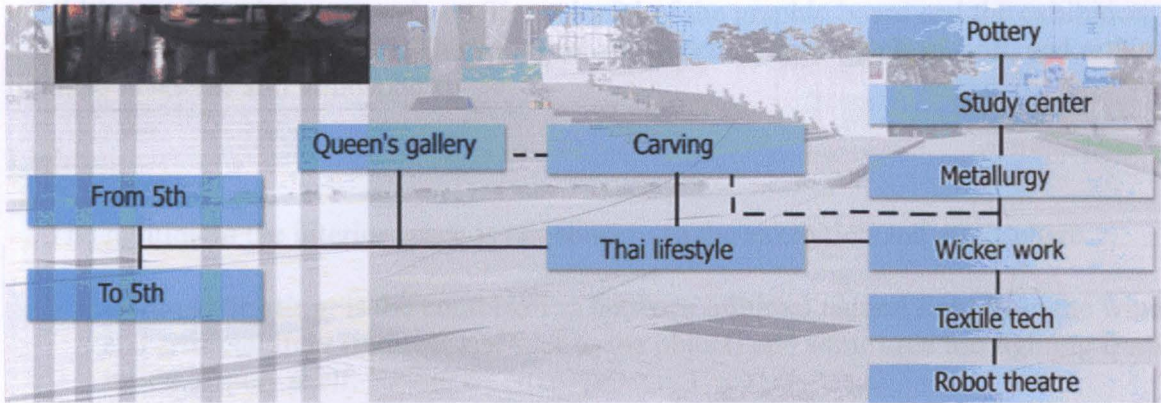


Fig. 3.3.24 (NSM sixth level)

Sixth level plan

Traditional technology

1. The Queen's gallery.
2. Caving technology.
3. Pottery technology.
4. Metallurgy technology.
5. Wickerwork technology.
6. Textile technology.
7. Study center.
8. Thai lifestyle.
9. Robot theatre.



Color

The building color is less effect to the exhibition because most of color is depended on the exhibition topic and the atmosphere. The colorful of the graphic board and the exhibition create the exciting atmosphere. The white colors on ceiling making clean, soft, and reflect the light, so make the soft atmosphere.

Lighting

The lighting in the interior space is not concern to the exhibition and atmosphere

- **General lighting:** is the combination between minimal natural light from the window and artificial light (indirect and spot to the object) and some area use lighting from inside display shelf.
- **Specifically lighting:** lighting on the display object such as inside the shelf, both use of incandescent or fluorescent for indirect light in the shelf, not only that still use spot light and flood light with filter for the special phenomenon atmosphere.

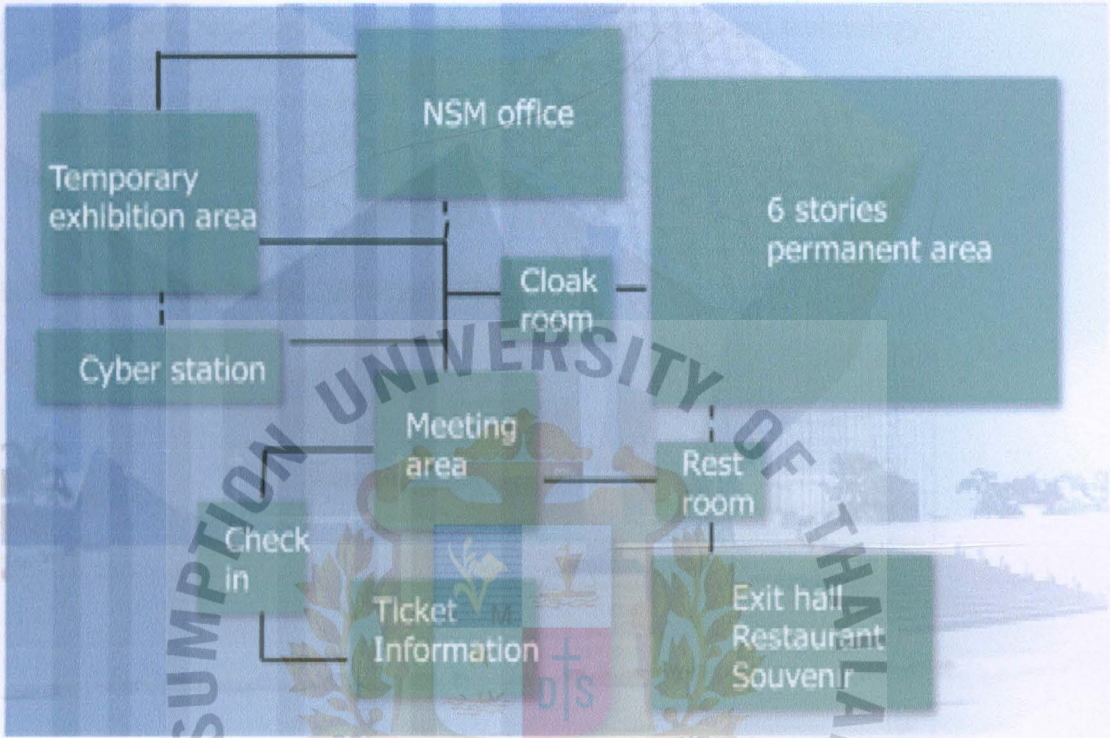
Material

The fantastic structure is the main concept of the high technology building both of interior and exterior.

- **Floor:** on the floor use many color of rubber tiles. And the variety of material is depend on he exhibition topics for example, the mock-up house floor use the real material carpet, wood, and ceramic tile.
- **Wall:** generally use concrete, steel and glass. The other material use in the partition and the mock-up such as plastic laminate, aluminum and etc.
- **Ceiling:** the smooth coating ceiling, curving ceiling and some suspended ceiling with hiding lighting inside. And some design to proper with the exhibition topic.

The functional diagram of NSM

National science museum introduces the knowledge of science and technology for example, theory, innovation and the progressing from the past to present and trend to the future. The exhibition area is including 40 series and divided into 6 parts by :



Facility and narrative study

National science museum introduces the knowledge of science and technology for example, theory, innovation and the progressing from the past to present and trend to the future. The exhibition area is including 40 stories and divided into 6 parts by :

2. Information, reception and introduction to the science and technology.
3. History and progressing of science and technology.
4. Fundamental of science and energy.
5. Science and technology in Thailand.
6. Science and technology in daily life
7. Vernacular science and technology.

Facility and area listing requirement (NSM)

Area	User	Furniture Requirement	Equipment Requirement
Ticketing Check-in and information	-general visitor -staff (4)	-ticket counter -chairs -cabinets	-computer -telephone -ticket check machine -fax machine
Meeting point	-general visitor	-bench	-no requirement
Cyber station	-general visitor -staff (4)	-working table -computer station -chairs -server case	-computer -telephone -printer
Cloak room	-staff (2)	-computers -chairs -shelves	-ticket number -telephone
Temporary Exhibition 1	-general visitor		-lighting track -projector
Temporary Exhibition 2	-general visitor		-lighting track -projector
Museum shop	-general visitor -staff (2)	-counters -show cases -chairs	-cashing machine
NSM office	-staffs	-working tables -chairs -cabinets -file drawers -computer station	-computers -telephones -fax machine -tasking lights -computer station
Exhibition area	-staffs		
Total area			18,000 SQM

Literature review

Nanotechnology

Nano is greek's language mean 1 / 1,000,000,000 so nano meter is 1 / 1,000,000,000 meter.

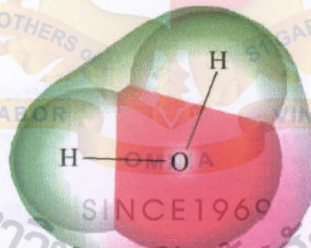
Atom ~0.1 nanometers, have 91 kind of atom, (proton+,Electron-) Smallest object that human can see with namal eye is ~10,000 nanometers

Light's wave (human' eye able to see) = 400-900 nanometers.

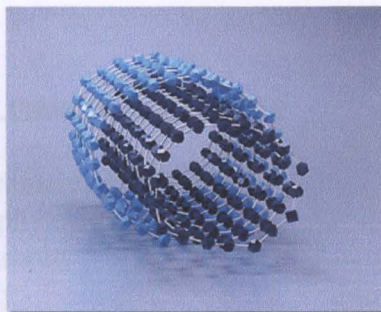
Object that smaller than 400 nanometers have to use some technic for able to saw.

1 H																	2 He																								
3 Li	4 Be																	5 B	6 C	7 N	8 O	9 F	10 Ne																		
11 Na	12 Mg																	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar																		
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe						
55 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn										
87 Fr	88 Ra	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo																								
		101 Th	102 Pa	103 U	104 Np	105 Pu	106 Am	107 Cm	108 Bk	109 Cf	110 Es	111 Fm	112 Md	113 No																											

NANO SCIENCE is study about molakul and structure in 1-100 nano meters it call "nanostructure"



NANOTECHNOLOGY is use nanostructure to make material,product ,equipment or machine that usefull for human.

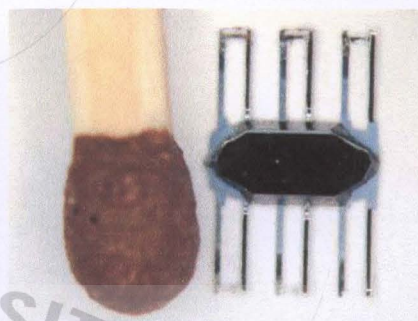


MEMS (Microelectromechanical system)

is make or build up mini machine for mantanance destroy part of humanbady or minimachine to make ciliconship it different from nanotechnology because MEMS is microtechnology (about in 1,000-1,000,000 nanometers) that bigger than nanotechnology.



Micro Robot



Nano Bobot

Quantum law

From past Physic and Newtons law are use until now but smaller object in nanoscale are not in Physics or Newton law. If we cut 1 m*m of gold in to 1,000 equal peace, gold is still gold and it have same quallity. But if we cut it in nano size every thing of gold will not the same such as collar, boil temperature, chemical quality,etc. every thing will change in to Quantum Law (protron, newtron and electron).

Process of nanotechnology

- Fabrication (top – down)
- Fabrication (bottom – up)

Measure nanostructure machine

- Scanning Probe Instuments (SPI)
- Spectroscopy
- Electrochemical
- Electron Micropy

Process & machine for make nanostructure

- Scanning Probe Instuments (SPI)
- Nanoscale Lithography
- Dip Pen Nanolithography
- E-Beam Lithography
- Nanosphere Lifoff Lithography

- Molecular Synthesis
- Self-Assembly
- Nanoscale Crystal Growth
- Polymerization
- Nanobricks and building blocks



Nanotechnology : A Gentle Introduction to the Next Big Idea

Mark Ratner & Daniel Ratner

www.smalltime.com

www.sciam.com

www.nano.gov

www.nanotechplanet.com

Site analysis

NECTEC (National Electronic and Computer Technology Center)

Owner : National Science and Technology Development Agency (NSTDA)

Location : 111 Paholyothin Road, Klong Luang, Pathumthani, 12120, Thailand

Area : 14,000 SQM

Completion : 2000



Location

Science center need to close to university, institute and industrial estate for cooperation about research to share and develop knowledge and human resource.

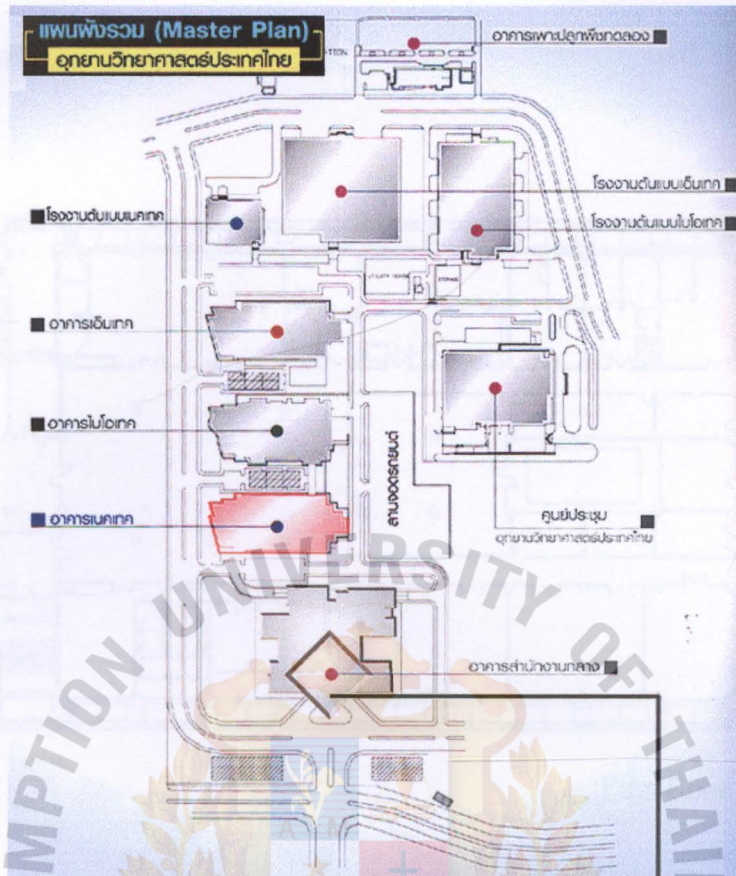


University that locate near site

- Thammasat university
- Bangkok university
- Srinakarintaraviroj university
- Kasetsart university
- Rangsit university
- Eastern asia university
- Rajaphat patchaburi vitayalongkorn institute
- Rachamangkara technology institute

Industrial estate near site

- Rojana Industrial estate
- Rangpoin Industrial estate
- Novanakorn Industrial estate
- Sangkadi Industrial estate
- Hi-tech Industrial estate



This building locate in science park (nstda) that have 3 technology center locate in side

- Biotechnology center
- Material technology center
- Computer & Electric technology center

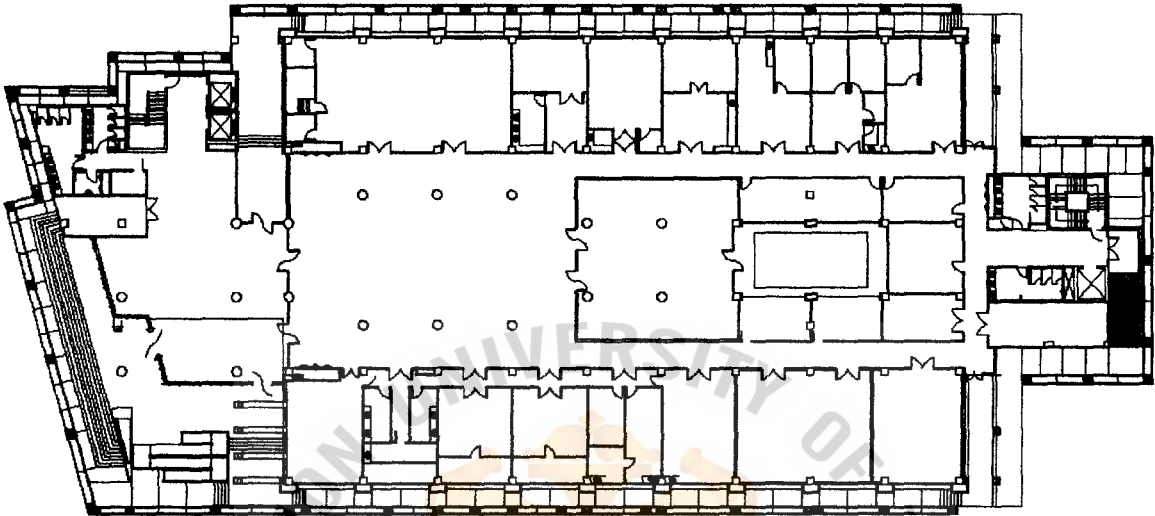
Science center need to close with university, institute and industrial estate for cooperation about research to share and develop knowledge and human resource.

Surrounding :	North	Adjacent with Boitec building
	South	Adjacent with NSTDA center office building
	East	Adjacent with Thammasat university
	West	Adjacent with car park NSTDA meeting center

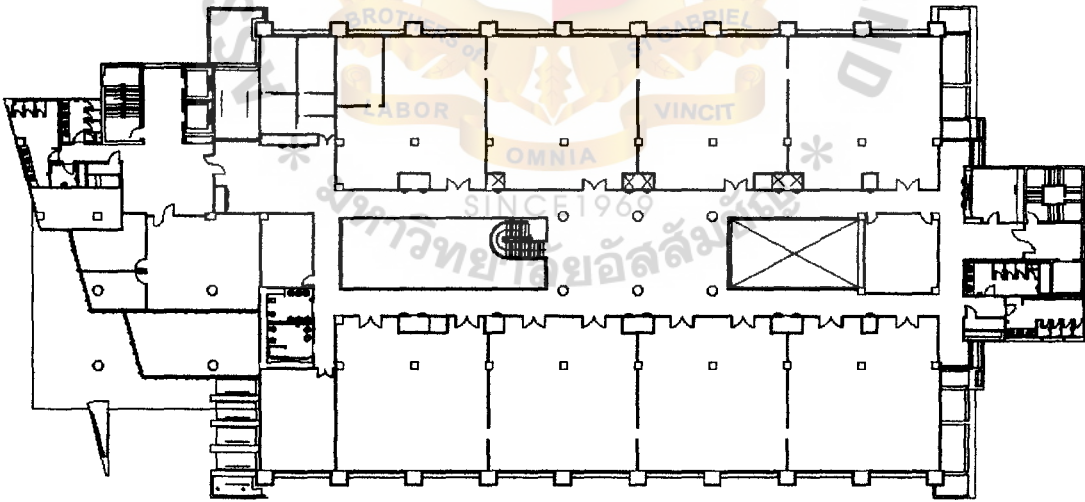
This building has 5 floor, idesk, 1 underground carpark. This building stand in good direction. It put narrow site in direction of east – west.

This building has 2 hall and they has sun roof at hall that make high temperature in 5th floor it hard to control temperature for laboratory. And hall that make hard to control people and security. This building was good system for laboratory it part water, air and electric in 8 module/floor it support for research laboratory. And it has enough carpark for user (parking 200 car).

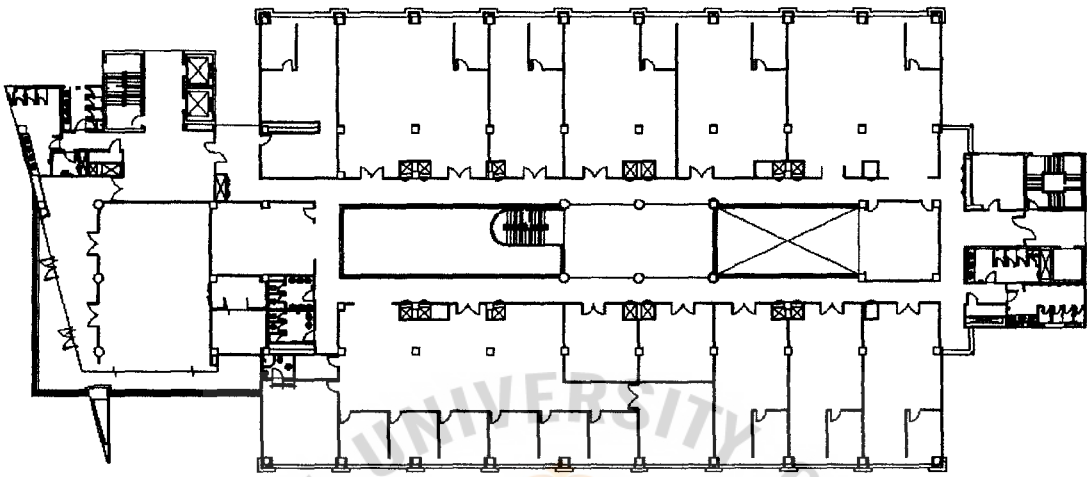
Floor plan



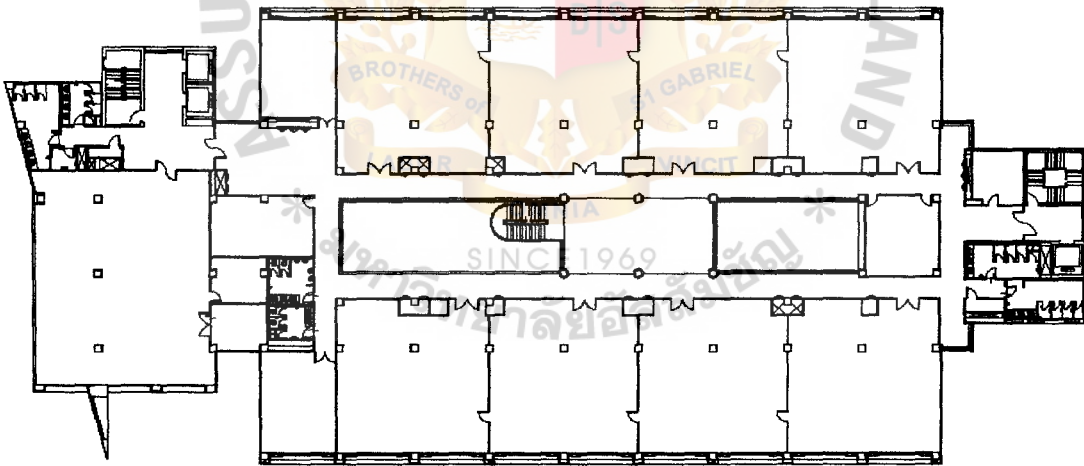
First floor plan



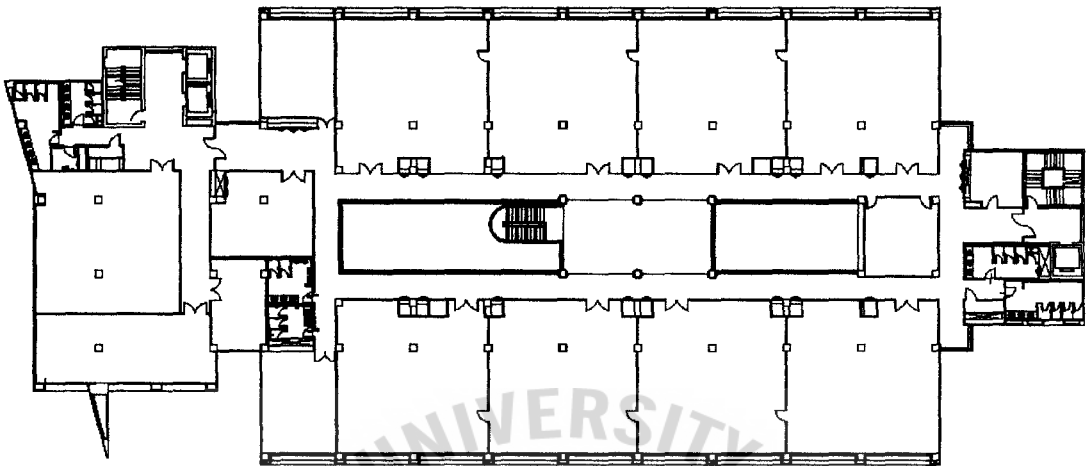
Second floor plan



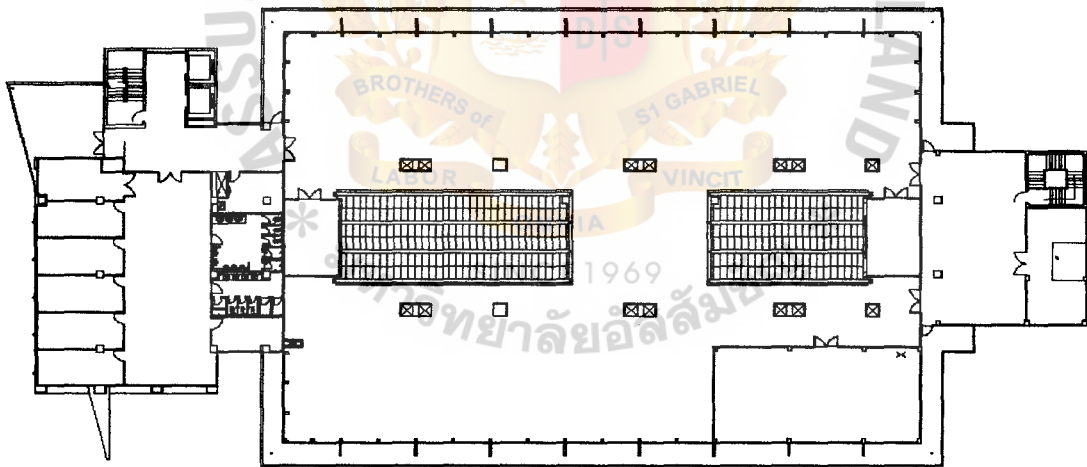
Third floor plan



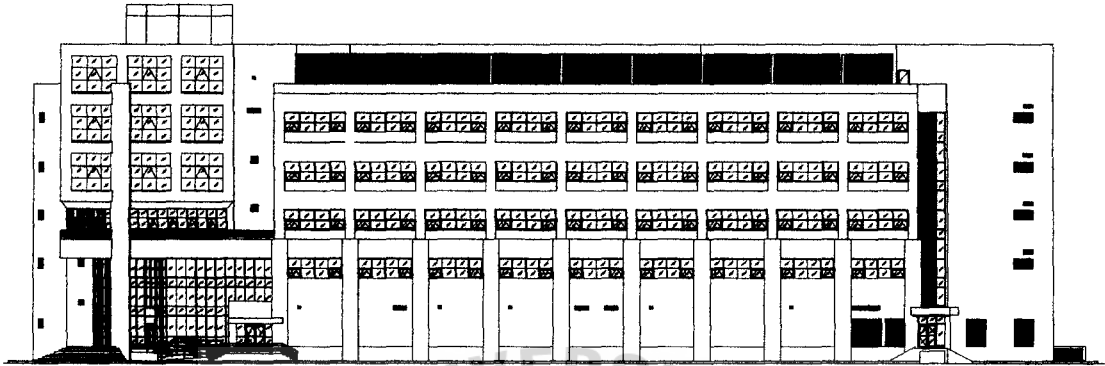
Forth floor plan



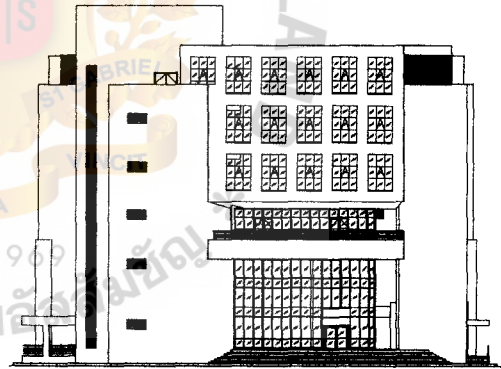
Fifth floor plan



Roof plan



Elevation 1



Elevation 2

Facility Study

- **Director of Nanotec, secretary**
- **Deputy Director of Nanotec, secretary**
- **Director of management division (1)**

Administration (1)

Finance (2)

Supplier (2)

Documentary (2)

Marketing manager (1)

Budget managing (2)

Planning (1)

Public service manager (1)

Reception (2)

Ticket & Staff (5)

Souvenir (1)

General service (1)

Driver (1)

Gardener (2)

Security (4)

- **Director of research division (1)**

Research laboratory management (1)

5 Laboratory (5)

Specialist (2)

Education management (1)

Scholar (2)

Lecturer (3)

Library management (1)

Librarian (1)

Librarian officer (1)

- **Director of cooperate image division (1)**

Exhibition management (1)

Exhibition designer (3)

Technical manager (1)

Audio visual (1)

Special technique (2)

Electric (2)

Mechanic (2)

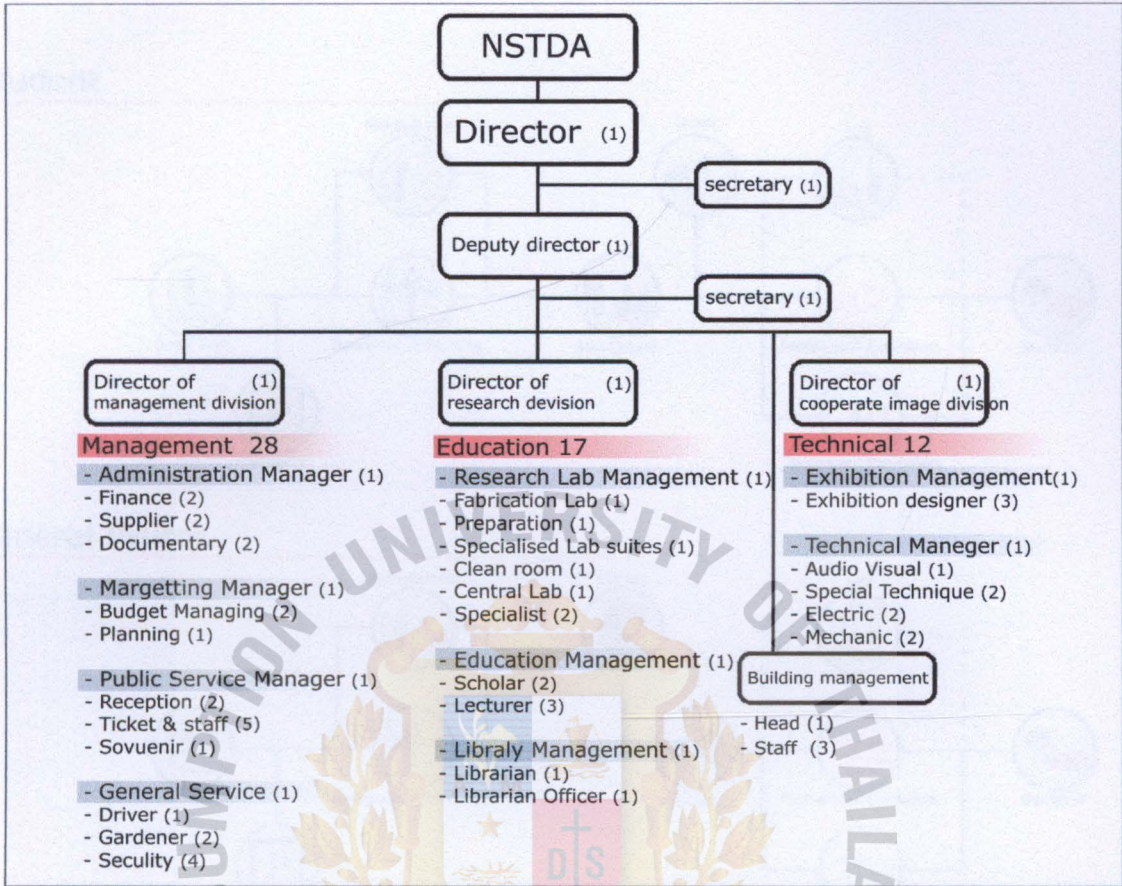
Building management

Head (1)

Staff (2)

Total stuff (67 person)
scientist (~30 person)

Organization chart



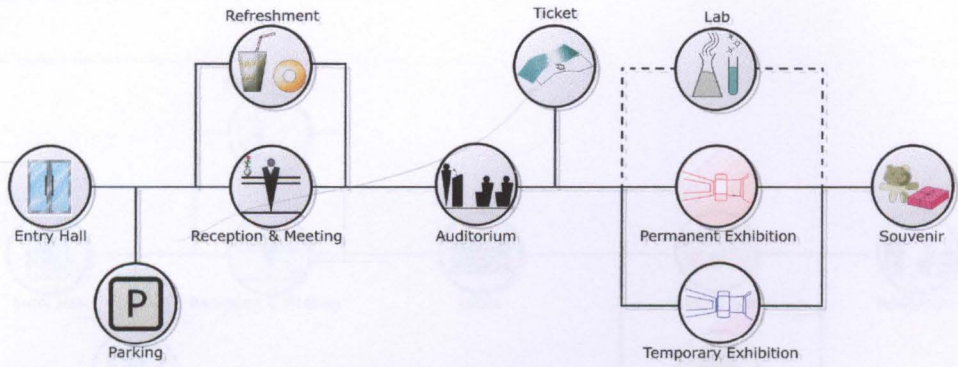
User behavior

Group	Function	Operation time	Student	General Visit	Lecturer	Scientetist	Rental	Staff
Public	Main Entrance & Hall	10:30 - 17:30	●	●	●	●	●	/
	Sub Entrance	8:00 - 19:00	/	/	/	/	/	●
	Library	10:30 - 17:30	/	●	/	/	●	/
	Auditorium	10:30 - 17:00	●	/	●	/	/	/
	Refreshment	10:30 - 17:00	●	●	/	/	/	/
	Souvenir	10:30 - 17:30	●	●	/	/	/	/
	Rental Office space	8:00 - 19:00	—	—	—	—	●	—
Exhibition	Permanent Exhibition	10:30 - 17:30	●	●	/	/	/	/
	Temporary Exhibition	10:30 - 17:30	●	●	/	/	/	/
Laboratory	Laboratory	24 hour	/	/	/	●	/	—
Office	Management	8:00 - 19:00	—	—	/	/	●	●
	Educational	8:00 - 19:00	—	—	●	●	—	—
	Technical	8:00 - 19:00	—	—	—	●	—	●

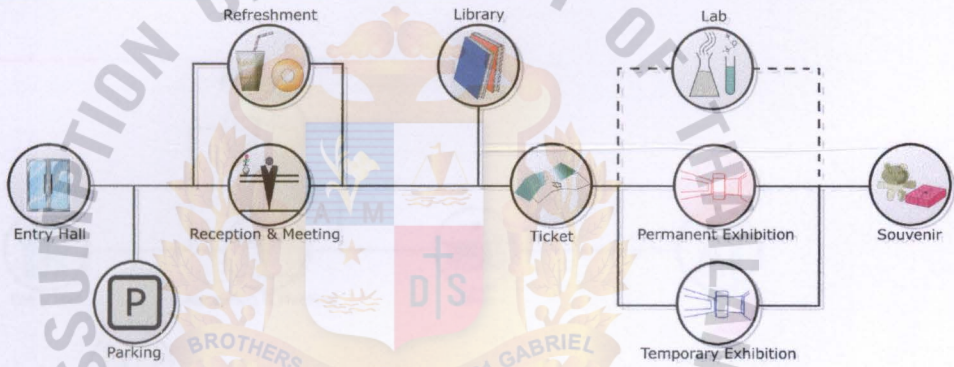
Mandatory	●
Desirable	/
Negative	—

User behavior diagram

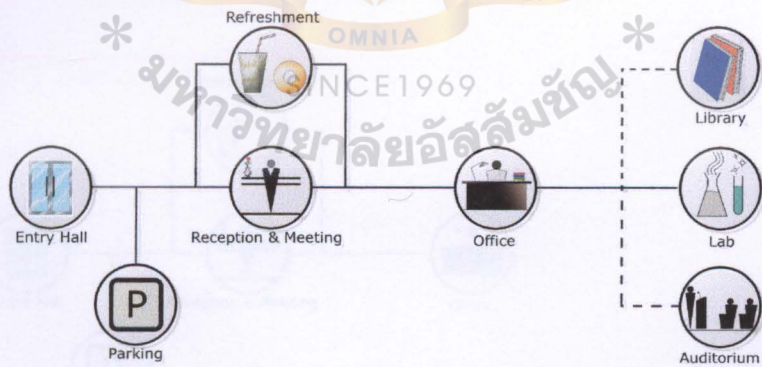
Student



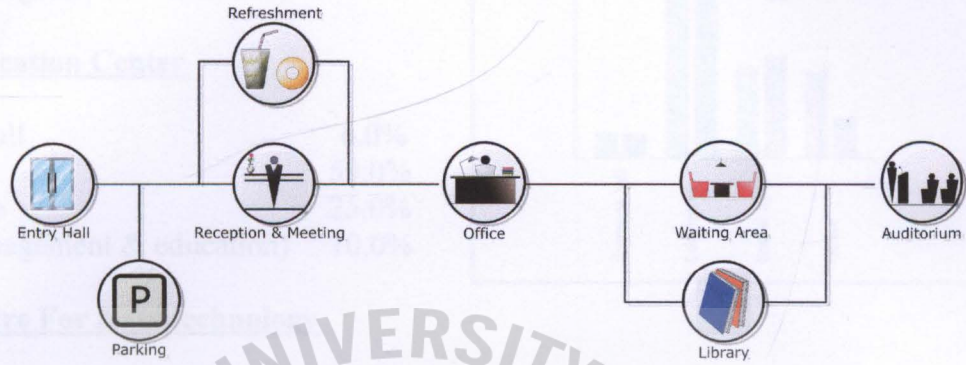
General Visitor



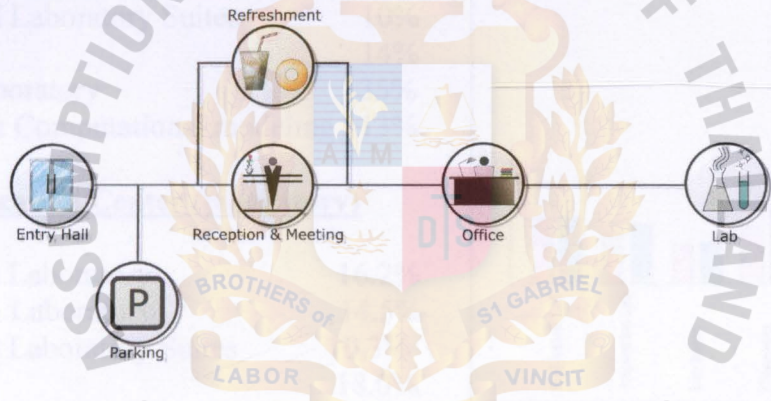
Rental



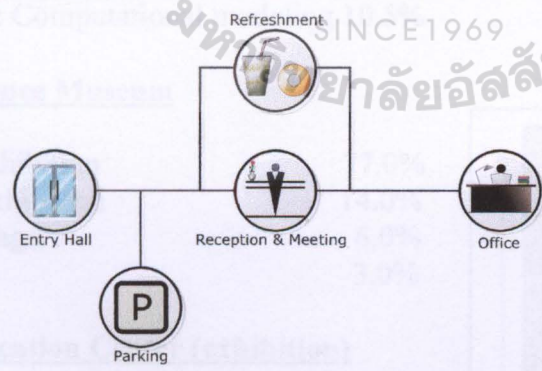
Lecturer



Scientist

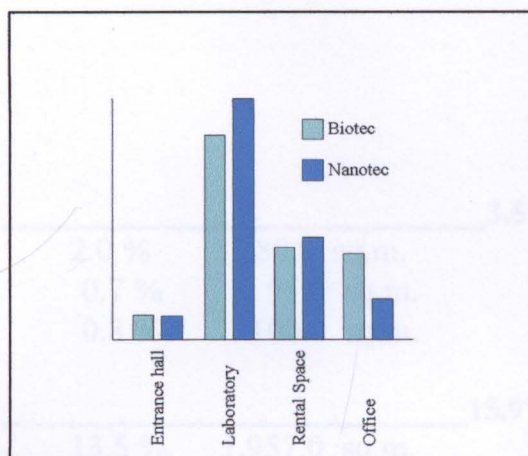


Staff



Biotec center

- Entrance hall	6.2%
- Laboratory	50.0%
- Rental pace	22.5%
- Office(management & education)	21.0%

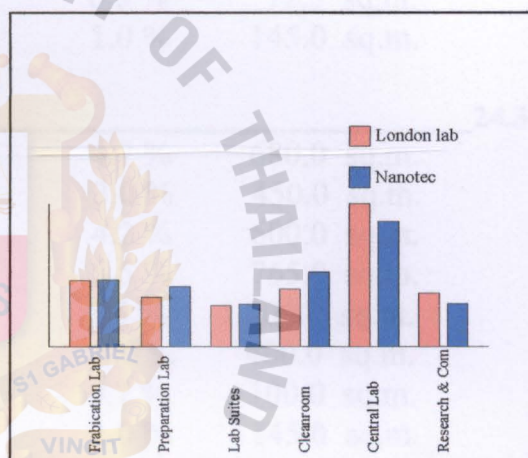


Nanotec Education Center

- Entrance hall	6.0%
- Laboratory	59.0%
- Rental pace	25.0%
- Office(management & education)	10.0%

London Centre For Nanotechnology

- Frabrication Laboratory	16%
- Preparation Laboratory	12%
- Specialised Laboratory Suites	10%
- Cleanroom	14%
- Central Laboratory	35%
- Research & Computational modeling	13%



Nanotec Education Center (laboratory)

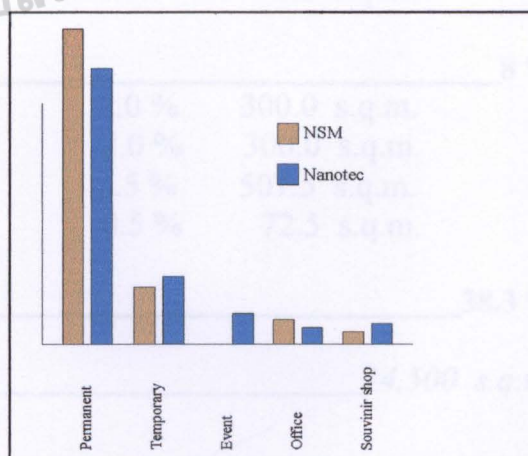
- Frabrication Laboratory	16.2%
- Preparation Laboratory	14.5%
- Specialised Laboratory Suites	10.3%
- Cleanroom	18.0%
- Central Laboratory	30.5%
- Research & Computational modeling	10.5%

National Science Museum

Permanent Exhibition	77.0%
Temporary Exhibition	14.0%
Office & Storage	6.0%
Souvinir shop	3.0%

Nanotec Education Center (exhibition)

Permanent Exhibition	67.5%
Temporary Exhibition	16.5%
Event for private rental	7.5%
Office & Storage	4.0%



Chapter 4

Function and Area Requirement

Area Requirement

Entrance hall 3.5%

- Reception, cashier, Waiting area	2.0 %	280.0 sq.m.
- Refreshment	0.7 %	95.0 sq.m.
- W.C.	0.8 %	100.0 sq.m.

Exhibition 15.9%

- Permanent	13.5 %	1,957.0 sq.m.
- Temporal	3.0 %	435.5 sq.m.
- Special exhibition (event)	1.5 %	217.5 sq.m.
- Souvenir shop	0.5 %	72.5 sq.m.
- Office & Storage	1.0 %	145.0 sq.m.

Laboratory 24.3%

- Fabrication laboratory	4.7 %	680.0 sq.m.
- Preparation laboratory	3.0 %	450.0 sq.m.
- Specialised laboratory suites	4.2 %	600.0 sq.m.
- Clean room	5.5 %	765.0 sq.m.
- Central laboratory	8.5 %	1,100.0 sq.m.
- Office	3.0 %	400.0 sq.m.
- W.C.	0.7 %	100.0 sq.m.
- Bedroom & relaxing area	1.0 %	145.0 sq.m.

Rental space for private 10%


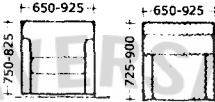


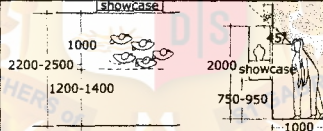


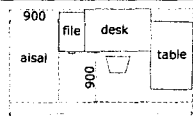
- Office	9.5 %	1,377.5 s.q.m.
- W.C.	0.5 %	72.5 s.q.m.

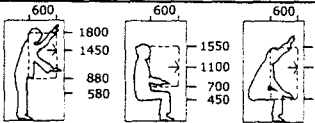

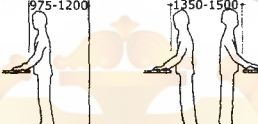
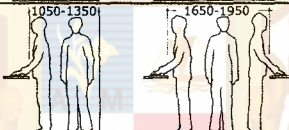
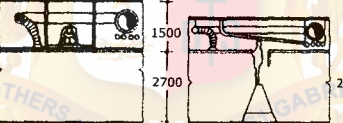
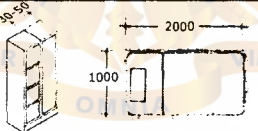
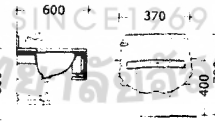
Management & Education 8 %

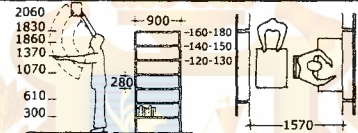
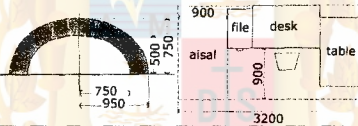
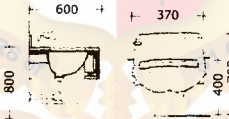
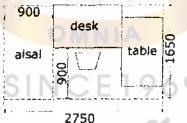
- Auditorium	2.0 %	300.0 s.q.m.
- Library	2.0 %	300.0 s.q.m.
- Office (officer)	3.5 %	507.5 s.q.m.
- Office (lecturer)	0.5 %	72.5 s.q.m.

Circulation 38.3 %

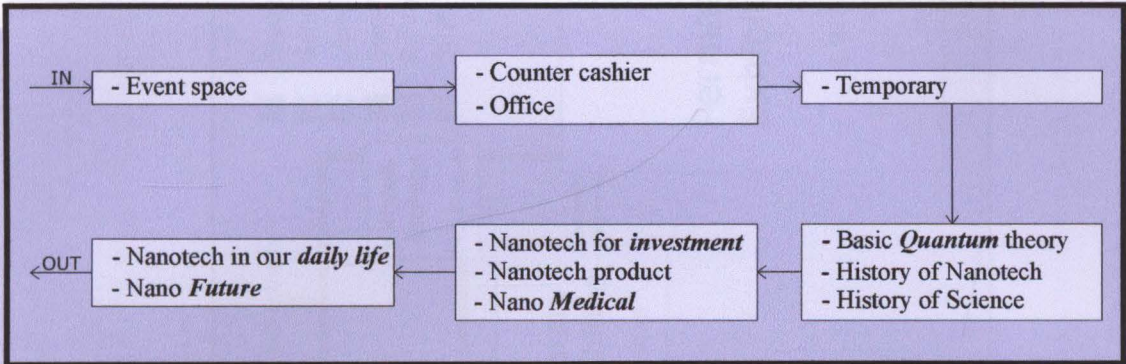
Building Area 14,500 s.q.m.

Area	Staff	Fur Requirement	Furniture Area	Equipment	Area	Privacy	User (max)
1.Reception	2	counter reception, chair		computer, telephone, fax	12 sqm	N	2
2.main hall & Waiting area	-	chair, table		information board	250 sqm	N	50
3.refreshment	2	counter bar, tables, chairs, stools, sink, freezer con, shelf storage		cashing machine, shelf display	95 sqm	N	20(seat)
4.exhibition counter	2	counter, chair		computer, telephone, fax cashing machine counting machine	16 sqm	N	2
5.exhibition permanent, temporary event	3	display product		computer, projector, special equipment...	2,393 sqm	N	250-300
6.survinior	1	window display, table display, self, boot cashier, storage		cashing machine, fax, telephone, product stand	72 sqm	N	20-25
7.restroom (public)	-	hook, mirror, small-shelf, wash basin, flush toilet		bin, hand dryer machine, soap fixture	100 sqm	Y	Fm 2 M 2
8.office (lab)	30max	desk, chair, cupboard, locker		computer, printer telephone,....	400 sqm	Y	6-30

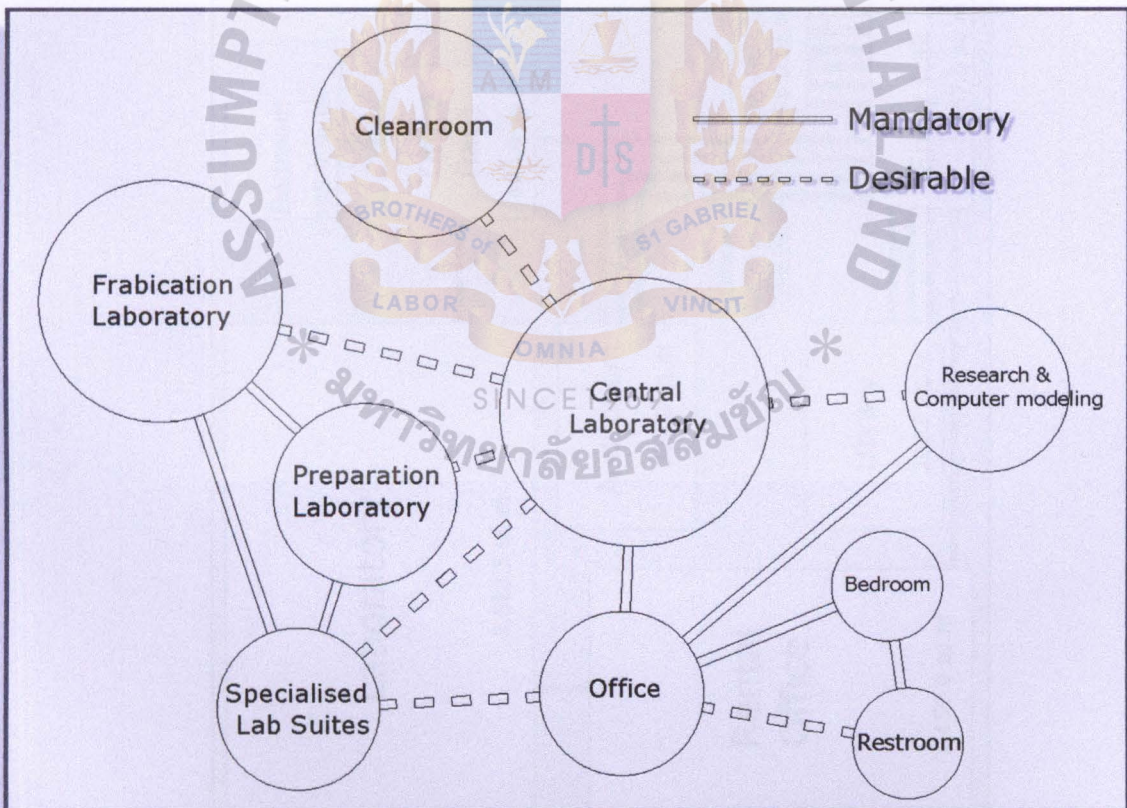
Area	Staff	Fur Requirement	Furniture Area	Equipment	Area	Privacy	User (max)
9.central laboratory	1	desk, chair sink, cupboard		computer, special equipment, etc.	1,100 sqm	Y	-
10.frabication laboratory	1	desk, chair sink, cupboard		computer, special equipment, etc.	680 sqm	Y	-
11.specialised laboratory suites	1	desk, chair sink, cupboard		computer, special equipment, etc.	600 sqm	Y	-
12.preparation laboratory	1	desk, chair sink, cupboard		computer, special equipment, etc.	450 sqm	Y	-
13.cleanroom	1	desk, chair sink, cupboard		computer, special equipment, etc.	765 sqm	Y	-
14.bedroom	-	bed, desk, chair, locker		T.V. , telephone	145 sqm	Y	12 unit
15.restroom (lab)	-	hook, mirror, small-shelf, wash basin, flush toilet		bin, hand dryer machine, soap fixture	100 sqm	Y	Fm 2 M 2
16.rental space	-	-	-	-	1,450 sqm	Y	15-20 unit

Area	Staff	Fur Requirement	Furniture Area	Equipment	Area	Privacy	User (max)
17.auditorium	—	white board, stage, stand		projector, slide, microphone, computer, etc.	300 sqm	N	250
18.library	3	counter, desk, table, chair, bookcase		computer, telephone	300 sqm	Y	75
19.office (officer)	36	desk, chair, cupboard, locker		computer, printer, telephone,	507 sqm	Y	36
20.restroom (lab)	—	hook, mirror, small-shelf, wash basin, flush toilet		bin, hand dryer machine, soap fixture	100 sqm	Y	Fm 2 M 2
21.office (lecturer)	5	desk, chair, cupboard, locker		computer, printer, telephone,	72 sqm	Y	5-12

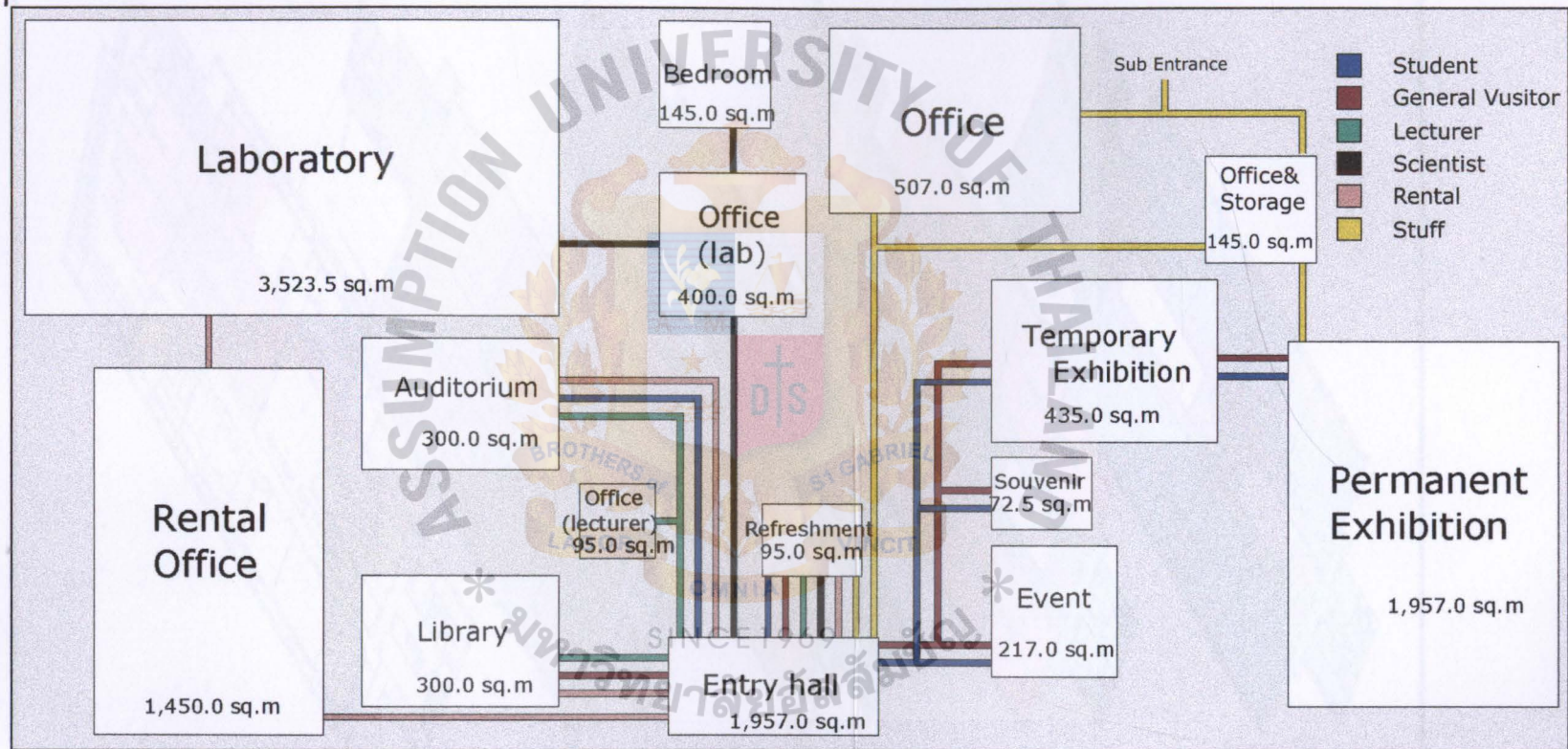
FUNCTIONAL DIAGRAM

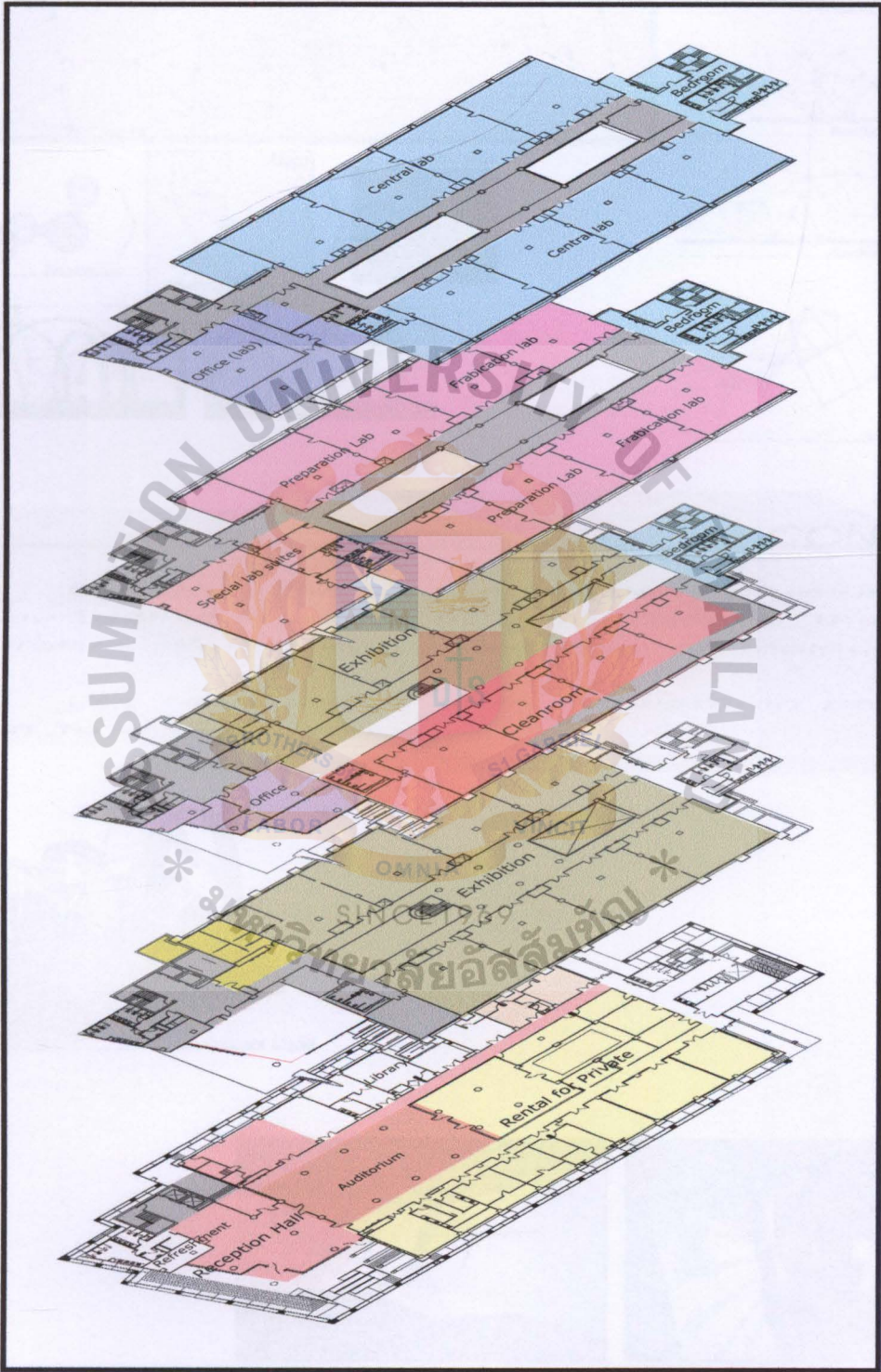


Exhibition



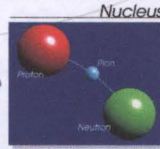
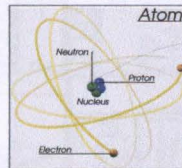
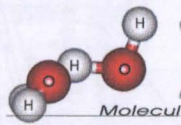
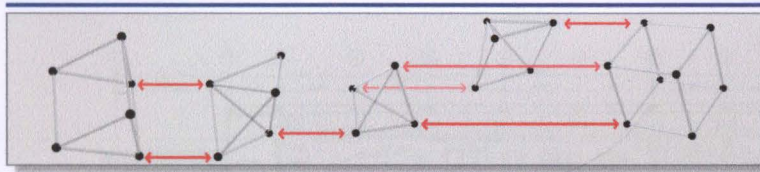
Laboratory





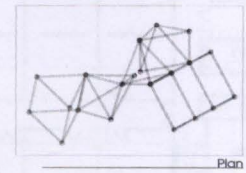
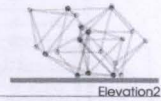
Chapter 5

Design Solution



Fabrication & Quark

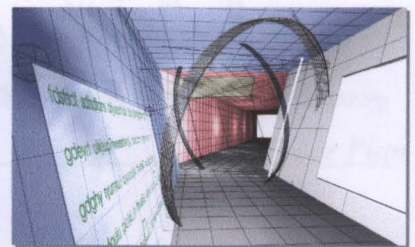
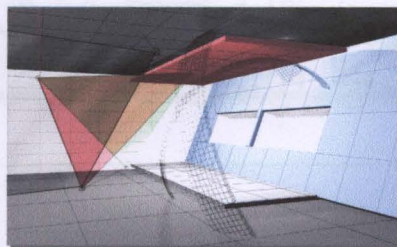
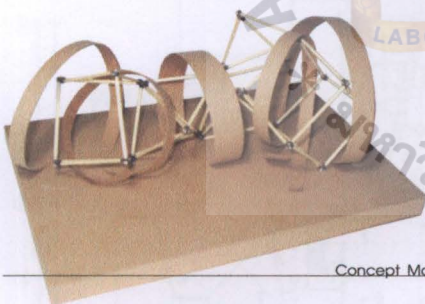
(nano world)



CONCEPT

Create a new form of atom structure by using in same of process same. Then fabrication it in to new type of molecule.

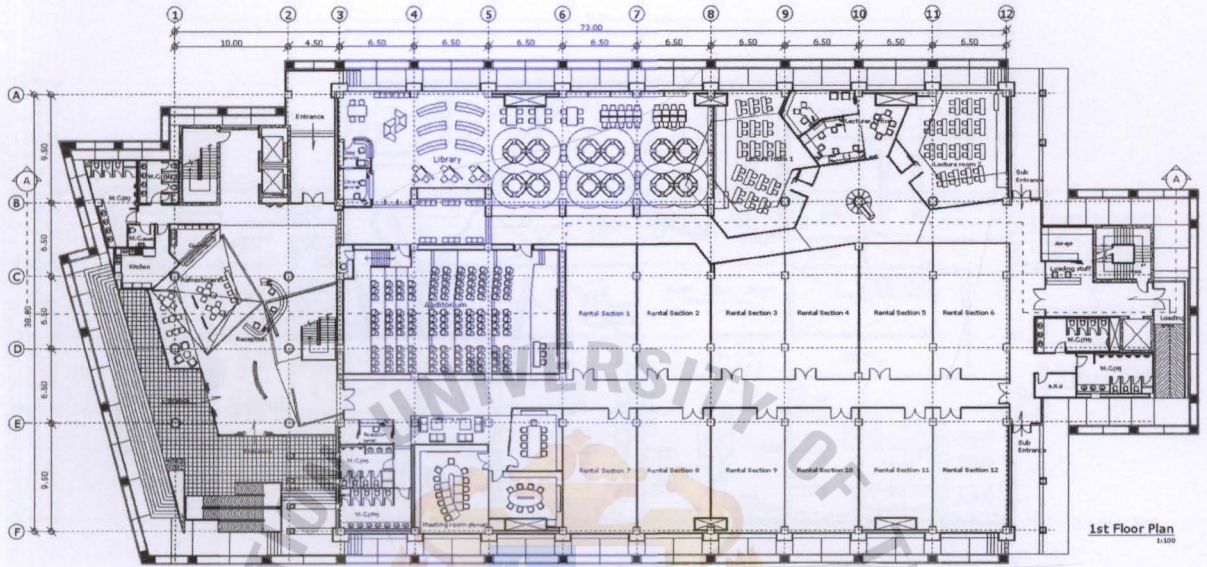
Use Nanospace from fabrication process in to design work.



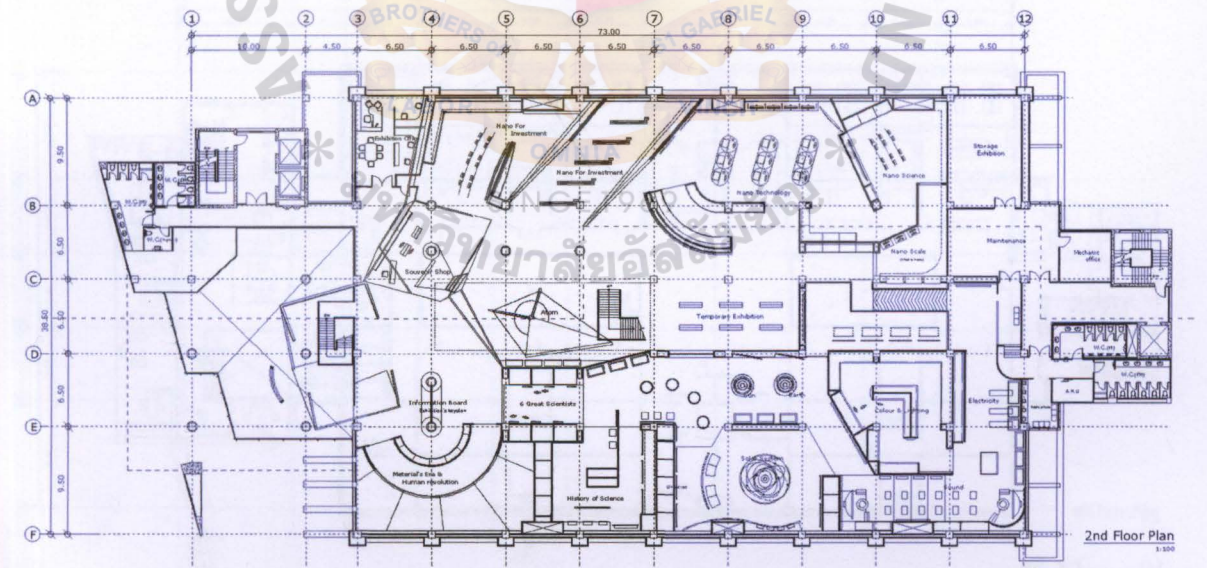
SKETCH PERSPECTIVE

Part of Design

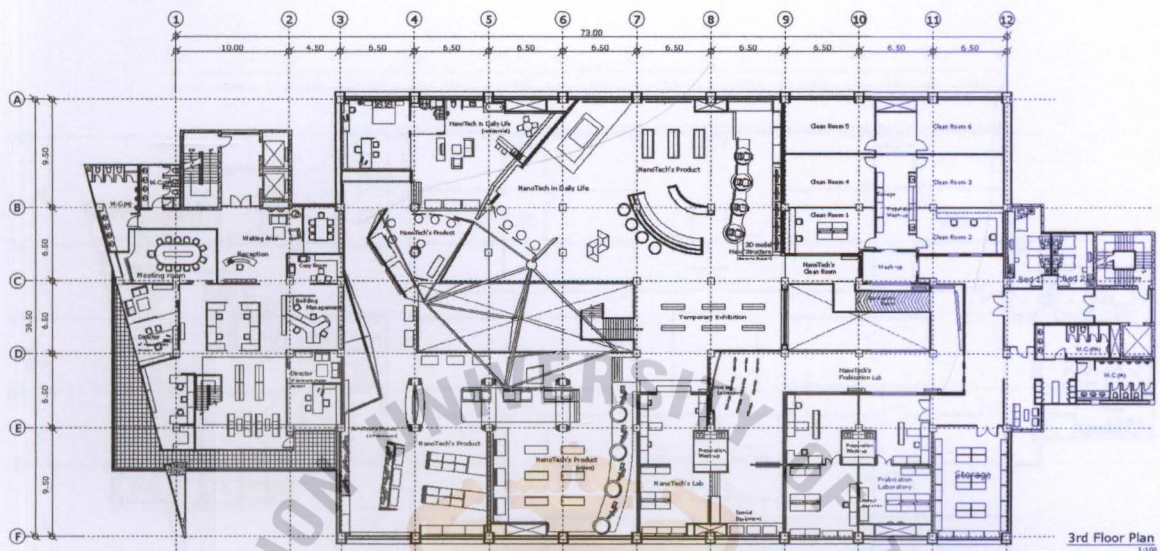
- Layout floor Plan



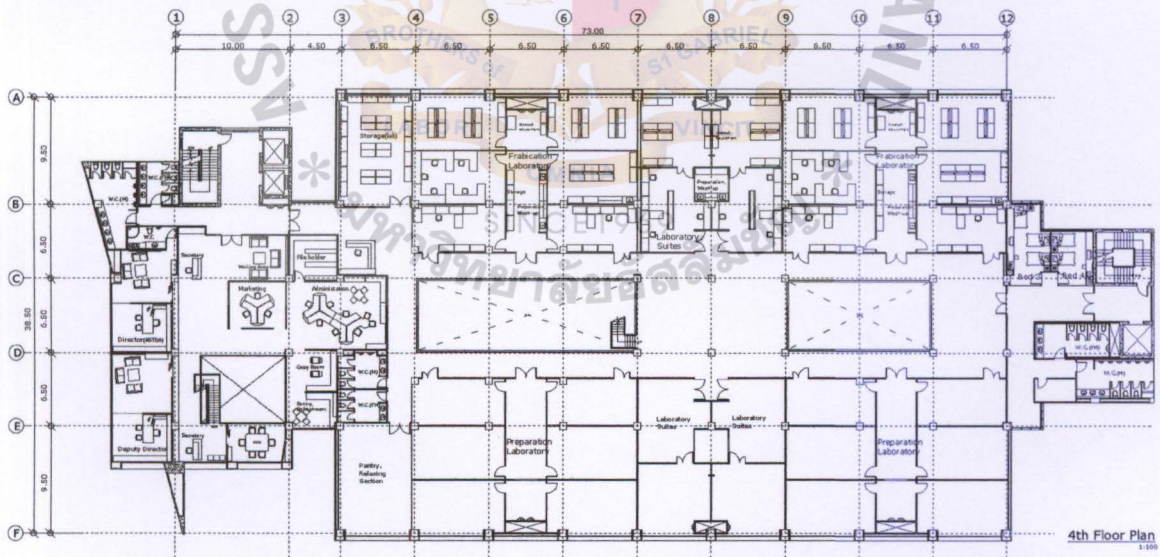
1st Floor Plan



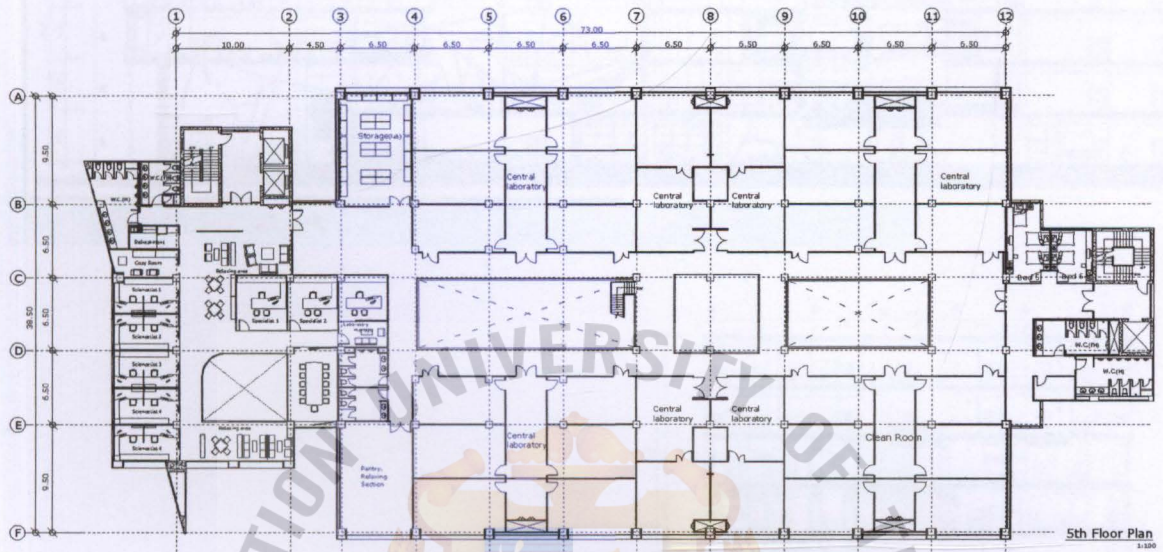
2nd Floor Plan



3rd Floor Plan

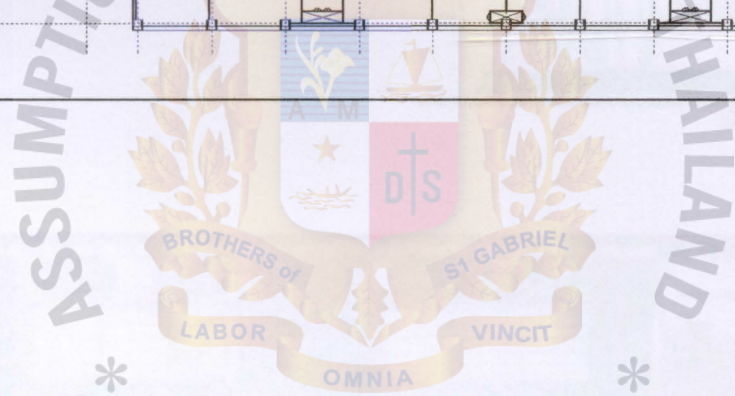


4th Floor Plan



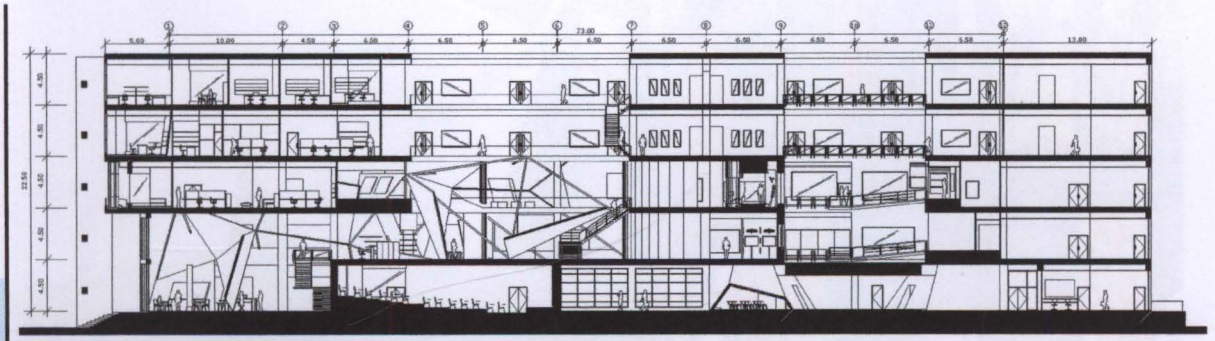
5th Floor Plan

5th Floor Plan

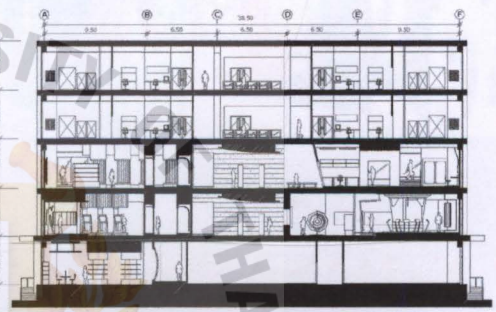


* มหาวิทยาลัยอัสสัมชัญ *
SINCE 1969

- Section



Section A-A



SECTION B-B

-Elevation



Elevation 1



Elevation 2



Elevation 3

-Perspective







