A DESIGN STUDY FOR M I T AUDITORIUM AND CHAPEL AREA
This thesis is submitted in partial fulfillment of the requirements for the degree of Master in Architecture at the Massachusetts Institute of Technology,

to: ________________________________

Professor Lawrence B. Anderson,
Head of the Department of Architecture,
Massachusetts Institute of Technology,

by: ________________________________

Hans Busso von Busse
Diplom-Ingenieur, Architekt.

September 7th, 1955
I wish to express my sincere gratitude for their most helpful assistance and advice to Dean Pietro Belluschi, Professor Lawrence B. Anderson, Professor Ernst N. Gelotte, Professor Robert B. Newman, Professor Thomas McNulty, and Dr. Jürgen Thomas.
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433 Marlborough Street,  
Boston, Massachusetts,  
September 7th, 1955.

Dean Pietro Belluschi,  
Department of Architecture and Planning,  
Massachusetts Institute of Technology,  
Cambridge, Massachusetts.

Dear Sir:

As partial fulfillment of the requirements for the degree of Master in Architecture, I respectfully submit my thesis entitled:

"A Design Study for M.I.T. Auditorium and Chapel Area"

Sincerely yours,

Hans Busso von Busse
ABSTRACT

A Design study for M.I.T. Auditorium and Chapel Area.

Principally this thesis follows Professor Saarinen's design program. This is based on the following details:

1. An auditorium with the capacity of approximately 1200 persons. In addition to that, the space required for rehearsal rooms, dressing rooms, cloakrooms, machine rooms, etc.

2. A small experimental stage with the capacity of approximately 200 persons. Again with additional rooms such as foyer, rehearsal, workshops, cloakrooms, washrooms, etc.

3. A chapel with about 150 seats including a sacristy.

The thesis is based on the supposition that the Harvard Cooperative Store, Bexley Hall and Hanley block will be removed within the next few years, thus this area is included in the design program.

It also gives consideration to a possible redevelopment of Massachusetts Avenue and a close connection of the east and west campus.

The thesis deals with the planning of a new shop area as replacement and expansion of the removed shops and restaurant
along Massachusetts Avenue. As it will be explained in exact details later, the thesis hereby follows the very appropriately elaborated program by Martin H. Cohem in his B. A. thesis 1954.

The possibility of using the present armory building as gymnasium is discussed.

In the course of planning the author felt it desirable, with view to the overall design, that the fraternity house situated between Baker house and Graduate house should be relocated.

It is assumed that the project is known in its particulars therefore the author refrained from rendering a detailed description here.

Hans Busso von Busse
GENERALIZED REQUIREMENTS AND IDEAS FOR THE DESIGN

The project fulfills the task of creating an opportunity for an ideally balanced academic life by providing facilities for cultural and recreational activities. Beyond the immediate requirements of a technical institute, it guarantees programmatically the psychological and, to a certain degree, the physiological balance to the primary object, the technical study. Differing distinctly in its function from the existing professional part of the school, it warrants the chief concern of this school: the creation of a general and universal intellectual atmosphere as the prerequisite to a truly creative work-performance.

The architectural idea results from the significance of this site for the Institute: the author made it a point to create a composition which, through its explicit formal contrast to the other soberly functional buildings of the campus, suggests the aspired complementation of the life of the Tech student. This atmosphere is to be achieved not only through the proposed buildings: an equally important part in the project is concerned with the adjustment of the buildings to the open space.

The author has a well balanced differentiated merging of open spaces in mind which appear through their location and proportional relation to the surroundings in a colorful
atmosphere. The projected buildings, in addition to their functional fulfillment of the program, have the task of initiating by their architectural appearance—mass, proportion, form and color—the interplay of spaces. The dynamic of the open space should be regarded as a factor of an equal importance as the architecture. To bring these two components in accordance with each other and thereby achieve an optimal effect of balance for the entire composition is the object of this thesis.
URBAN DESIGN CONSIDERATION

With regard to proportion and scale, the west facade of the M.I.T. building is well balanced. Because of its representative significance, the author proposes to include the west facade in the overall campus design. Its present function as mere street facade does not satisfy. With particular regard to the projected close connection of the east and west campus, it seems appropriate to make use of it as a plaza facade. It is assumed that the Graduate House will remain in its location. Because of its massive appearance and the importance of its location from the point of view of city planning, it has to be included in the design project. These two factors led to the initial design suggestion presented in the attached sketch:

A large plaza development based on the M.I.T. building and the Graduate House, completed through the addition of the new building complex which is the object of this thesis.

The same development takes place on the Memorial Drive front: following the pattern of the large M.I.T. court on the opposite side of Massachusetts Avenue, a plaza, surrounded by Baker House, Graduate House, and the new buildings, open towards the Charles River, is planned. The design project regarding the Armory and Rockwell Cage follows the same pattern.
SCETCH
URBAN DESIGN CONSIDERATION
THE DESIGN

The overall conception is based on three principal thoughts:

1. A system of elevated walkways connecting buildings and open spaces.
2. A pattern of intercommunicating plazas and courts as a result of a correspondence of buildings.
3. A parking system which organically follows the overall conception.
PRELIMINARY A

OVERALL SITE DEVELOPMENT
PRELIMINARY B

OVERALL SITE DEVELOPMENT
A. Traffic Consideration for Pedestrian and Car

A cross of two perpendicular axes dominates and organizes the site. The one, "main bridge walkway" runs in North-South direction parallel to Massachusetts Avenue. It begins at Memorial Drive and ends branching off into the shopping area near the Armory. The main elements are grouped predominately around this axes: all the building and all the open spaces. The second axes runs in East-West direction, connecting the existing M.I.T. building with the west part of the campus crossing Massachusetts Avenue. The two axes can be regarded as an elevated frame on which the pedestrian traffic takes place, giving access to the buildings and to the open spaces. The pattern of these intersecting walkways are meant to present along their course in a continuous variety of perspectives the colorful display of space and form.

The predominant movement in the site focuses on the walkways cross, its elevated level is constant. The elements of the composition located above or below that level consequently suggest an atmosphere of rest.

Aside from this function the elevated walkway system fulfills an important esthetic task in regard to the overall conception; it prevails as a constant horizontal element of rest throughout the entire composition and separates as well as relates
the forms, plans and colors. As frame of reference it provides scale and relation for the pedestrian.

Automobile and pedestrian traffic are completely separated. With regard to the automobile traffic - that is mainly the parking problem - here are some basic thoughts:

The extremely heavy traffic on Massachusetts Avenue intercepts the unity of M.I.T. considerably, and divides the campus into a Western and an Eastern part. As already has been mentioned, the Institute places great emphasis on a close connection of these two parts. Therefore, the plan has been developed to depress Massachusetts Avenue. A wide bridge above the through traffic then would re-establish the natural unity of the campus. This project has been adopted in the thesis.

Two secondary streets on the surface level branching off Massachusetts Avenue are provided for M.I.T. traffic. No traffic to Massachusetts Avenue is provided for the new project, since the author feels that it would only enhance the existing traffic problem. A strong frequention of the above mentioned subsidiary streets would be an immediate consequence. This would contravene the principle of the project, which is to reduce the interference to the campus life with the automobile traffic to as large an extent as possible.

With view to the close connection between the West and East campus, it therefore seemed necessary to avoid any additional increase of traffic along Massachusetts Avenue.
Consequently, the new project is connected to Memorial Drive by another axis. Running underneath the elevated walkway system, it extends from Memorial Drive to Vassar Street. It gives access to the parking area, to the auditorium, the experimental stage, the chapel, and to the shopping area. An additional parking lot is provided for the shopping area. The main entrance is located at Memorial Drive. The second entrance is located between the Armory building and Rockwell Cage. The parking system will be discussed later.
B. Open Spaces and Plaza

In various levels the open spaces surround the walkway system. Stairs and ramps serve as connections and allow a gradation of the different levels.

Dominating is the main plaza where the chapel is located. Enclosed by the M.I.T. building in the East, by the Graduate House in the South, by the auditorium and the experimental stage in the West, and the cafe-restaurant in the North, the plaza is in congruity with the aforementioned urban design pattern.

One of the main problems with which the author was confronted during the planning was the protective shielding against Massachusetts Avenue (noise, dust, etc.). A massive protection would have had the effect of a division, therefore buildings could not be used. The solution provides a wide green belt, and in addition, a depression of the inner plaza.

The detailed pattern of the plaza is the following: located in the Northern part is the M.I.T. shopping center, in the Southern larger part is the chapel; both are visually separated by the East-West arm of the elevated walkway cross. Around the chapel the area is paved. The pattern of the pavement consists of concrete stripes forming long squares which are filled with a dark natural stone. Some of the enclosed
squares are unpaved and will be filled with trees and flowers. Benches are set up all over the area. Hedged ramps and retaining walls surround the depressed part of the plaza. At the North end of the paved area, a water basin is located, from which the terraces of the restaurant emerge.

This area is provided mainly for the student's recreation. It is meant to interpret the sensation of scale and spacial enclosure which should induce the student to make use of it as a place of rest.

Restaurant, bar, and coffee shop are thus arranged that the activity of this part extends into the plaza, filling it with life.

A plaza is formed by the buildings which enclose it; however, it takes specific activities which must interact with the architecture of the enclosing buildings in order to achieve the characteristic effect of a plaza.

Towards North, in the shopping area, the plaza branches off into a pattern of small courts which will be discussed later. A second, smaller plaza develops from the elevated walkway system. The auditorium, the experimental stage, and a new fraternity house surround the square, which is enclosed towards West by a 1-1/2 storied gallery. This gallery will be used for open air exhibitions. The plaza serves
predominantly for social meetings and entertainment. It is slightly descending towards the center, in form of a square-shaped terrace. Filled with water, the square can be used for ice skating during the winter.

The fraternity house is elevated above the plaza level, resting on pillars. This opens the plaza towards Memorial Drive.
C. Parking

A natural adaptation of the parking facilities to the project is one of the primary goals of this design study. The author provided an underground parking area, located underneath the elevated plaza development. It has an entrance toward Memorial Drive and one toward Vassar Street. It is not completely covered. Through an interplay of open and covered spaces, of pavement, grass, and trees, of ramps and stairs, the natural adaptation of the parking area to the campus is achieved.
PRELIMINARY STUDY MODEL OF THE CHAPEL
D. The Chapel

The center of gravity of the total architectural design is the chapel. Its location as well as its esthetic form underline its significance for the academic life. The religious faith as a fundamental force of human culture rules the intellectual and creative power of man. The chapel as a religious center in the university campus therefore deserves a dominating position in the project. Consequently, all the other buildings are subordinated to it in their arrangement and form.

The basic conception of the chapel is a polygonal central room, enclosed by a folded concrete structure. Its design idea is derived from the byzantine central church. Small side chapels are grouped around the cupola-covered central room. Originally it was intended to give in these side chapels, to each of the various church groups which hold their services in the chapel, a symbolic place (shrine) of their own, thereby architecturally expressing the multiconfessional character of the church. However, the author arrived at the conclusion that only by absolute neutrality, that means omission of display of all symbols, the common use of the chapel by different religious groups is possible. This omission of every architectural decoration made a carefully executed, impressive interior design necessary. Thus, the interior becomes the gravitating element in the church design. The author
PRELIMINARY STUDY SKETCHES OF THE CHAPEL
considered it necessary, to being the exterior of the chapel in accordance to the interior design, and at the same time emphasize in the exterior the significance which is given to the chapel through its central dominating location in the project. He believes that the chosen construction pattern of folded concrete slabs offers an optimal realization of these considerations.

The floor plan is based on a novagon. The side walls enclosing the interior are organized in three horizontal parts: the bottom part forms the side chapels which appear triangularly shaped in the elevation; in the middle part the side walls contract gradually, giving the chapel a tapering shape. The structure then opens up in a funnel-shaped top part.

The chapel is covered by a glass cupola, resting on the joint of the middle and top part. The cupola is supported by narrow concrete ribs, emerging from the nine joints of the folded concrete slabs, which form the side walls. Two ribs emerge from each joint, diagonally traversing the cupola, avoiding zenith. Through the cupola the light enters the chapel vertically. An additional source of light is given by the glassed side chapels.

Two of the side chapels provide the entrances. The low ceiling of the entrances allow only a gradual spatial comprehension of the chapel interior. The altar is a concrete block
PRELIMINARY STUDY MODEL OF THE CHAPEL
resting on a two-step platform. The seats are arranged in semi-circular form, opening towards the altar. The organ is located above the side chapels, opposite the altar.

The sacristy and side rooms are located underneath the chapel.
E. Experimental Stage (Little Theatre)

The design idea of the experimental stage is to enclose seating area, stage, foyer, and rehearsal room in one very simple, yet expressive rectangular form. Basically it is a room, in which audience and stage area are blended to a natural unity, allowing the audience to take an active part in the performance. In contrast to the professional theater the experimental stage places little emphasis on the full satisfaction of the spectators imagination and the perfection of the execution. Instead, it attempts to produce an essential constructive experiment, performed by amateurs. This confinement to the essential in spirit and purposes is to be expressed in the architecture: a one-room building, which brings all elements into a close mutual relation.

The realization of the design idea is the following: the building rests on a system of five pairs of pillars. Each pair, connected by a horizontal concrete beam, forms an all supporting block. The beams carry the building floor, which separates the workshops on the parking area level from the one-room theater. The wave-like concrete exterior walls are developed out of the pillars. They extend not below the plaza level. The workshops are enclosed by glass walls. The wave-like form of the exterior walls is a result of acoustical considerations. In addition, its softness emphasizes the contrast to the chapel and creates the atmosphere of a "play house".
The inside of the walls is lined by a wooden structure. The fronts are in sharp contrast to the side walls; plain in form, they are ornamented with colorful mosaics. The building has a flat concrete roof, supported by steel beam structure, which rests on the pillars.

The stage complex reaches from the parking area level into the main room; it is raised above the floor level. From this level the seating area ascends towards the other end of the building. It is supported by concrete beams, which span between the pillars, leaving an intermediate space between the exterior walls and the seating area floor. One enters the seating area by stairs from the side opposite the stage.

The technical facilities are provided in the stage complex; a freight elevator is installed also.
F. Auditorium

The form of the auditorium is based on its function as a common room for lectures, concerts and other events, and on its importance in the plaza pattern. In clear contrast to the chapel, which is meant to provide balance and solution of its composition in itself, the auditorium, in addition, has an important function from the point of view of urban design. It initiates the interplay of open spaces, which is the overall principle of this study. The interior design idea bases on a funnel shaped penetration of two forms which develop all the elements of the auditorium: stage, seating area, balconies and foyer.

The roof of the building consists of a folded concrete frame structure. It rests on triangular pillars on the East and West fronts of the building, and spans it lengthwise, giving regard to the acoustical requirements.

The plain, ornamented concrete side walls on the North and South side of the building are detached and have no supporting function. As plaza facades they are of considerable architectural importance which makes a balanced and fine treatment of their surface necessary. In their form they follow the interior design pattern and indicate the separation of auditorium and foyer. They have a three dimensional effect which is increased through the overlapping of the roof.
structure. These overlaps have a triangular form and point towards the break in the flow of the sidewalls (dividing line between foyer and auditorium). To provide light for the basement rooms underneath the auditorium - rehearsal rooms, dressing rooms, machine shops, etc., the sidewalls rest on pillars, reaching from parking area level to the level of the plaza. Behind the pillars glass walls are set up. The West and East front are glazed up to the roof, filling the space between the triangular pillars.

The arrangement of the two forms determining the interior design is the following: the larger one is open towards the West front, the main entrance, and follows the sidewalls along the greater part of its length. It tapers towards the end forming the stage on the East. It consists of a wooden structure reaching close to the folded concrete ceiling without being connected to it. It encloses the smaller form, which surrounds the seating area - open to the stage. This is also a wooden wall, beginning at a comparatively low height at the stage, ascending steeply towards the rear. Its curved end separates the foyer from the seating area. Between the two forms choir and organ balcony are placed. This interior wall consists of paneled wood for the sake of the acoustical effect. Wide stairs lead from the foyer to a gallery and from there to the balcony. Purpose of the balcony with 300 seats, in addition to 900 seats in the seating area, is the achievement of an optimal flexibility of the auditorium. In case of need
SKETCHES ILLUSTRATING THE DEVELOPMENT OF THE AUDITORIUM
AND THE FOLDED SLAB ROOF
additional seating space can be provided at the choir and organ balcony. In this case they can be reached via the gallery. Choir and organ balcony are normally entered from the stage. Wash and cloakrooms are located between foyer and the seating area. A projection room is provided above the restrooms on the gallery. It is connected with the stage through the choir and organ balcony and has also a direct stair connection to the foyer. Emergency exits are on either side of the orchestra pit.
G. Shopping Area

The development of the shopping area follows the suggestions of Martin H. Cohen. They were elaborated together with the present shop owners and M.I.T. student commissions. The establishment of the following stores is considered:

- Harvard Cooperative Society
  Sale space 5000 sq. ft.
  Storage place 6000 sq. ft.

- Drugstore
  Sale space 4000 sq. ft.
  Storage place 2000 sq. ft.

- Grocery and delicatessen shop

- Cleaner and Tailor (in the basement if possible)

- Barber Shop

- Record Shop

- Restaurant, Bar, Cafe, etc.
  About 3000 sq. ft. for eating
  Serving, cooking 500 sq. ft.
  Storage 500 sq. ft.

The shopping area is located adjacent to the restaurant and recreational area. Consequently in its design, the author had to regard not only its commercial purpose, but also an adjustment to the recreational character of the adjoining area. This led to the following design idea:

The shopping area is combined with the adjacent recreational area, forming an inseparable unit. It represents a pattern of buildings, spaces and walkways, following herein the overall design, yet in a reduced scale. It is thereby adapted organically to the overall project.
The visual separation of the shopping area from the chapel plaza is underlined by the West-East elevated walkway. It does not intersect the spatial interplay of these two areas. This achievement is of great importance: both elements differ in the function of their buildings, with view to the overall composition, however, it was necessary to blend them into one design unit. While the general spatial pattern warrants the unity of the composition, the difference of the functional character of the two elements is expressed by reciprocation of the detailed pattern: on the one hand it is a large open space which surrounds the separate building of the chapel, in the shopping area on the other hand small open spaces are surrounded by buildings. The shopping area is accessible from all sides. However, it is mainly entered from Massachusetts Avenue and via elevated North-South walkway. The area is traversed by elevated walkways connecting the shop buildings. The level difference between the courts and the walkways provides daylight for the shop basements which serve as storage rooms. In the center of the area, bank and post office are located, surrounded by Harvard Cooperative, and drugstore in the East. Grocery, barber and record shop in the West and the restaurant in the South. The restaurant is elevated above plaza level resting on pillars. This allows an open air restaurant service below the building. Towards North there is a small milkbar-cafeteria annex. The restaurant kitchen is located so that it can serve the main restaurant, the open air restaurant and milkbar. Supply service to restaurant and shop-buildings takes place underground.
MIT

A DESIGN STUDY FOR MIT AUDITORIUM-AND CHAPEL AREA