Architectural Design of A

Y.M.C.A. Centre & Beach

In Ras Beirut

By

Merguerian, Arshag

1951

100

A R C H I T E C T U R A L D E S I G N

OF

A Y.M.C. A. C E N T R E & B E A C H R E S O R T

IN

R A S B E I R U T

BY

ARSHAG MERGUERIAN - B.A.

A.U.B. May 1951

" This thesis is submitted to the Civil Engineering Faculty in partial fulfillment of the requirements for the degree of Bachelor of Science in Civ. Engineering."

A C K N O W L E D G M E N T

The Author gratefully acknowledges his indeptedness to Mr. K. Yeramian of the Civil Engineering Faculty A.U.B. for his most inspiring advice in the preparation of this thesis.

LIST OF PLATES

CONTENTS

I N T R O D U C T I O N

" It may be that God made the world, but that is no reason why we should not make it again ! ! "

Bertrand Russell

This thesis has not been ghost-planned! its lack of thoroughness in detail-work (if so judged) and its errors may remain to be my own. Though the author's constant inspiration - in the preparation of this thesis - has been based on readings from modern thinkers and writers of art or architecture, there has never been a blinding influence of the emotions. Yet, one cannot deny that feeling, above all, takes command in Architecture!

It is important to mention here the conscious parallel drawn between the scientific brain and artistic creation by W.D. Teague in " Design This Day" (1) ch. XV (" Beyond the Rules"), the most fruitful scientific thought does not advance in any such hay-foot, straw-foot manner. It is borne forward by creative imagination as much as by reason. It surprises the truth by flashes of brilliant insight long before the structure of supporting proof can be built up.

(1) Is one of the best post-war British publication on Design.

In short , construction work and the growth of the city of Beirut is in its full sway at present. Disorder and congestion may grow to its worse if expansion is not encouraged outside the city limits. One way of encouraging such expansion is by establishing recreational and social centres outside the city but at the same time easily accessible; thus drawing people especially youngesters, away from the business centres with the aim of improving living conditions.

It has not been the sole idea of the author to produce an original architectural project to serve humanity decades ahead.

All that has been attempted - with a possible escape from draftsmanship competitions' - is the realization of a possible solution for (a) an improvement of the young generation, and (b) city expansion.

Effort is exhausted in the presentation of what really should be appealing to a coming generation under our own conditions of life and behaviour . At the same time an efficiently planned project to serve their needs. Architectural functionalism and a modern outlook on decore and sculpture has never been amiss the eye of the author. A compromise has always been reached between architectural designs and the structural possibility of forms, as discussed in the chapter of "Evolution of plan and forms", in this project.

There can be no doubt on the benefits and contributions of the Y.M.C.A. recreation centre in Jerusalem which was built in about 1934. At least it served the youth of the time. Beirut, being a larger city, on a programme of expansion and growth, in city planning cries the need of decent recreational centres for youngesters and resorters.

A group of college buildings, systematic studies in educational institutions only, may not help the regeneration of youth. The meeting of men from different sects, creeds, religions in athletic games has long been recognized to be a great aid in achieving "democratic" understanding of life.

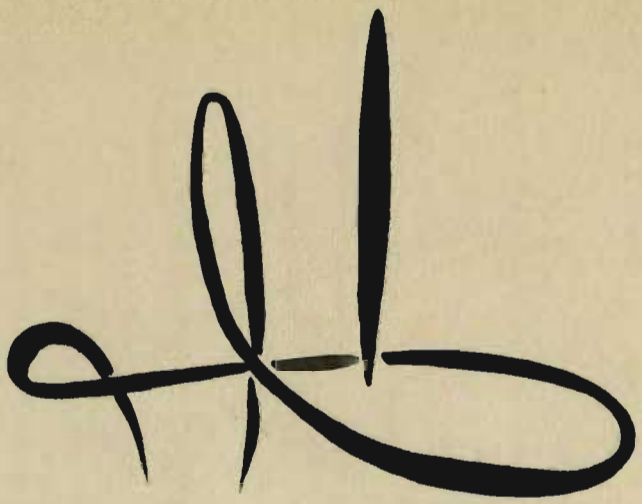
Before town-planners may start on their games, before Bus-Terminals and Transport Stations are designed, before the concrete-designer may start with his bold - calculating mind on structural analysis of such projects, a goal should be set to "aim" all and to start on! Beirut people have to see what's there ahead in their own eyes, away from the city so as they may start out on their "walk"! A recreational centre, social gatherings in the outskirts of the city, a small resort or a youth centre - as in this thesis - away from the city limits may serve city expansion and advocate modern transportation systems.

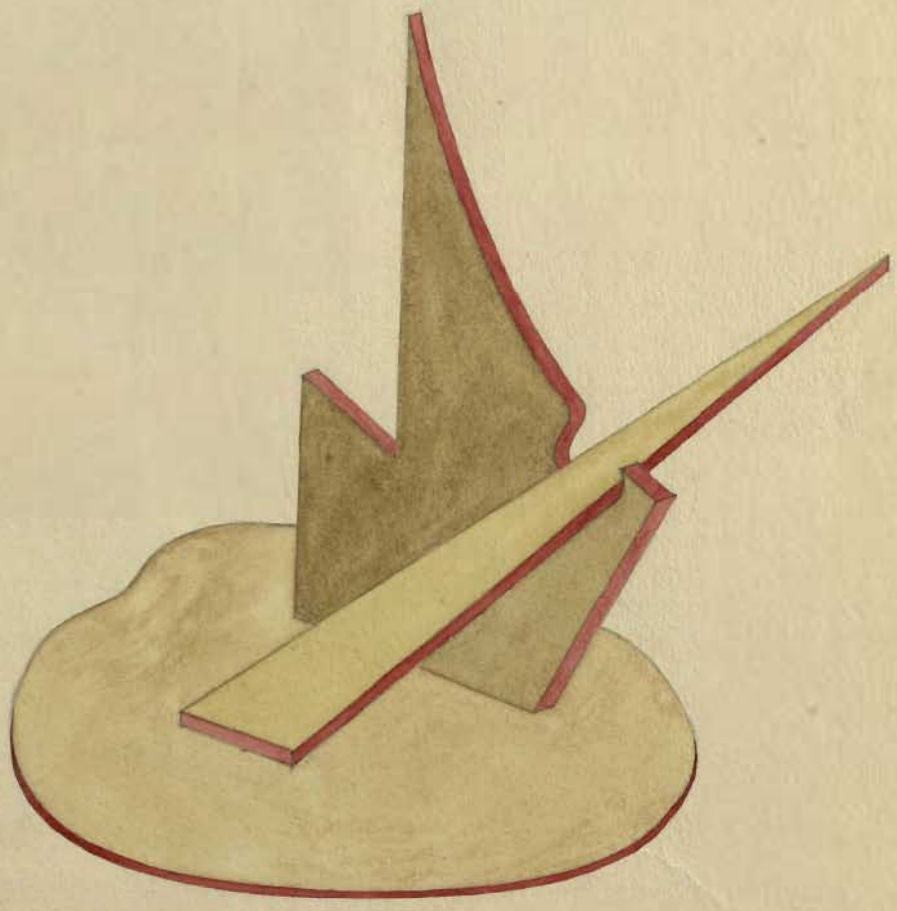
CHAPTER I

EVOLUTION OF PLAN & FORM

" Form in Architecture follows function". It is hard but not impossible - to say otherwise. The statement above holds true especially in industrial and commercial design. In domestic ecclesiastic, monumental architecture "form" and "function" are divorced in the hands of the architectural genius.

The project, I may claim , is not the vague anticipations of a visionary enthusiast! Some forms may not seem to be functional at the beginning. Some authorities today relate the forms, of buildings to machines and some to biological forms, after they can serve the requirements plus have aesthetic appearance. Such may be the cover of the gymnasium after an impression of the spreading wings of an eagle: rising from the ground and with a parabolic curve dashing ahead overhead. While in the auditorium, the bold forms of the shoulders at the lower part, embracing an inside audience, with an umbrella-shaped covering may suggest a man's meditative gesture. The proportion and balance of these forms and the rest of the building may be difficult to judge and approve at first sight. In general "proportioning and balance" are mostly achieved in rectangular forms. Contrary to this " balance" could be achieved also through a completely dismentaled, irregular solid

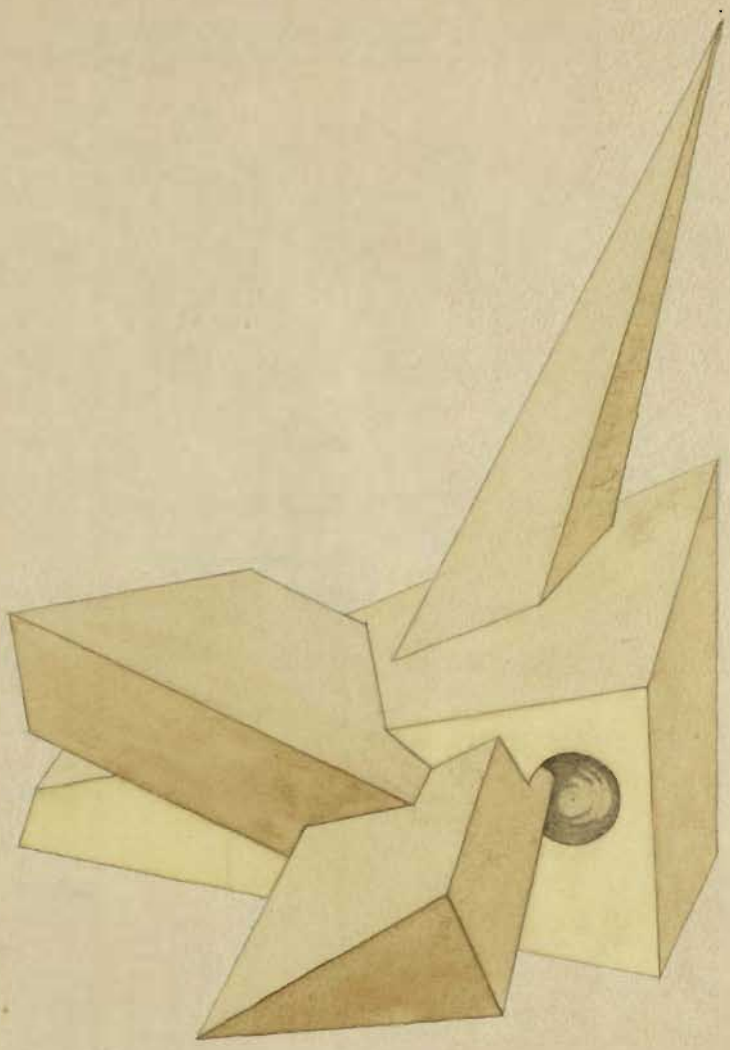




- Fig 1

Balance in plain & lines

-Author's



- Fig 2

Composition of Balance
in mass.

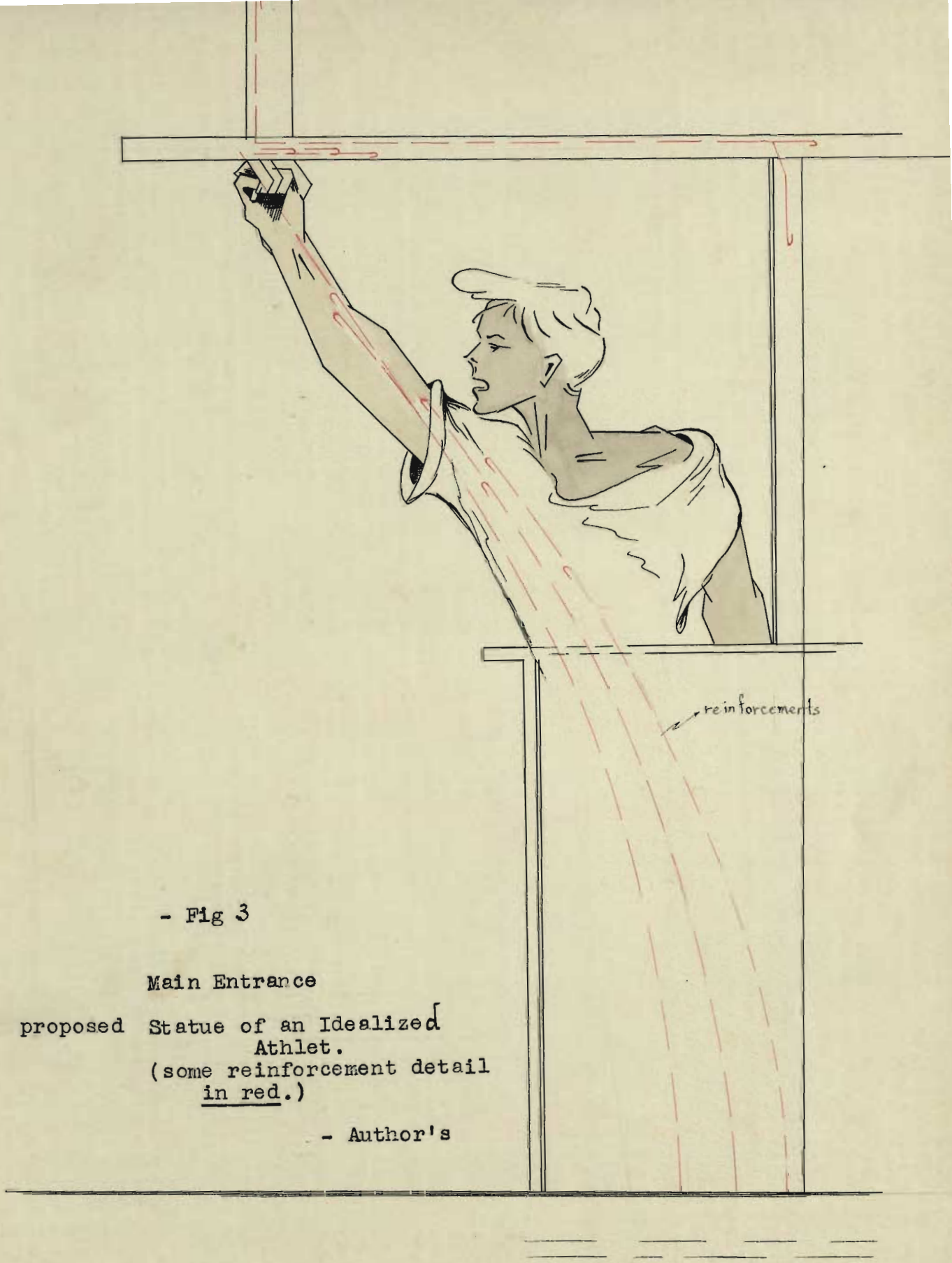
(Bulletin Board)

- Author's

forms or unevenly cut plains with proper grouping as illustrated in Figs. 1 a, 2 , especially composed by the author as a supporting proof.

The whole project has been tried to proportion after "plan" and function are studied; being on a shore line the building is spread along the shore to occupy most of the beach. It has to ~~be~~ possess proper façades on approach as well as from the beach side. Proposed pre-cast in concrete or in dressed-stone-statues are to appear also at the entrance and at the swimming pool, see fig.

Vitality and vigour, essential for youth, were chosen to be also the characteristics of the building. Whether I succeeded or not in doing so remains to the judges of today, and may (if the dream survives) remain to the judges of tomorrow!



- Fig 3

Main Entrance

proposed Statue of an Idealized Athlet.
(some reinforcement detail in red.)

- Author's

CHAPTER II

STUDY AND RELATIONSHIP OF UNITS

Summary of plan:

Basement - Boiler and heating plant rooms, cabines and swimming facilities, kitchen store rooms.

Ground Floor -A Gymnasium

Athletic facilities (showers, lockers, lavatories)

Medical office and equipment rooms.

Lecture rooms and offices.

B. Auditorium

with auxiliaries.

C. Salon and Lounges, quiet rooms

D. Restaurant-kitchen.

1st Floor - Library, reading room, study rooms. classes(4-5) verandas, overlooking balconies to swimming pool. Music room.

Upper stories- Bedroom wings for resorters with lounges for each story.

Of relationships and functions: The universal principle of the subordination of the parts to the whole and the whole to its functionalism has been adopted in the general planning of the project.

An attempt has been made to provide ample possibilities and efficiency especially for the use of the ground floor by both visitors and resorters; such as the accessibility to the restaurant, the use of the athletic section (North wing) approaches to the beach or to the swimming pool (central) for incoming visitors, members and the resorters directly.

A distinct separation is set between the auditorium, lounges (i e quiet sections in south wing) and the gymnasium, necessary provisions are made to maintain a quiet atmosphere by sound proofing (Use of Heraklit see Fig 14, 15, 16, 17.

In the library and the upper stories for resorters space is used with freedom from conventionalism and depressed apartment enclosure, with a freshness of approach in the opinion of the author.

CHAPTER III

DESIGN OF THE GYMNASIUM

The planning of the gymnasium and its auxiliaries is carefully done to facilitate athletic performances.

The dimensions for a basket-ball court-yard were chosen from the official Basketball Rules of the Amateur Athletic Union of the U.S., which recommends 50 X 90 ft. for College age. Marginal boundaries, position of baskets, seating arrangements are based on the American Standards for Athletic championship games.

The capacity of the gymnasium during Athletic performances is about 700 on seating.

The arrangement of rooms for showers, toweling, toilet store and minor physical exercises (squash, boxing) are carefully studied for maximum efficiency and service.

A dressing-locker room is designed for a peak load (of about 35 persons) in a double athletic performance plus an additional percentage. Locker dimensions and area are based on recommendations for secondary school age in America (or elsewhere)

In the shower room, immediately accessible to the dressing-locker room, shower heads will be at least 1.20 meters apart of a non-clogging type.

The toweling room, has (as recommended) the same total area as the shower room and is again immediately accessible to both showers and dressing-rooms. As could be noticed in plan (plate) a nonshatterable, transparent panel is installed for supervision of toweling between the toweling dressing room.

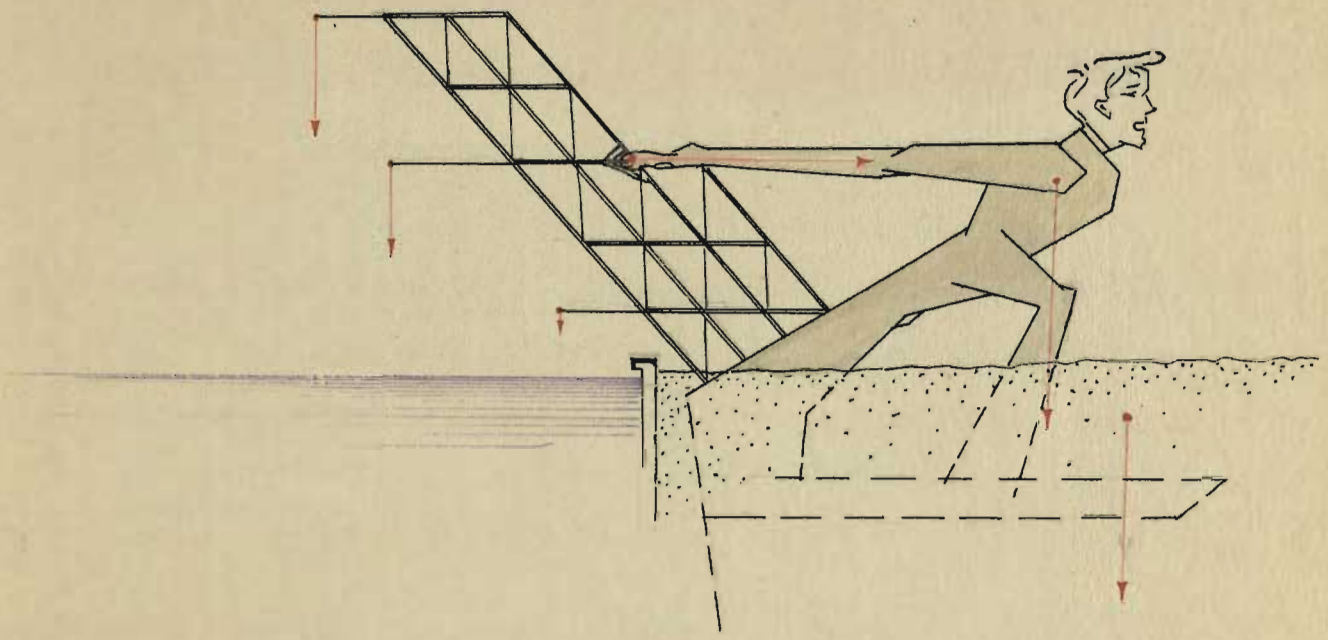
Towel service and storage room is provided with adjustable shelves in sufficient number to accommodate the load. A check-out window should be opened immediately adjacent to the toweling room.

Toilets too are conveniently placed to be used freely by shower-ers and athletes on field. Sufficient mirrors, built-in drinking fountains are to be installed in this section. A small separate section for visiting-teams is provided. No provision is madefor a women athletic section since the club will be meant only for male physical membership. Outsider women teams may use the "visiting team" section for which reason toilets etc. provided in same.

Spectators' sight line adjustments are done (see plate ?XI) by increasing the stepped seats of the gymnasium towards the back.

Swimming Pool

Though the beach is accessible a swimming pool is also designed, which is to serve for swimming(teaching), fancy diving, water polo and for athletic contests.



-Fig 4
proposed

Swimming pool Statue
- cast in concrete-

(In red - Forces to apply and counteracted by statue.)

- Author's

The pool dimensions are selected to fulfill all the necessary requirements for the above mentioned performances. Standards for depth, length and width for international athletic contests are made use of.

As regards the sanitary characteristics of the pool, the text "Municipal and Rural Sanitation " by Ehlers & Steel has been consulted with. A "recirculation type " is to be used for this pool, where disinfection, bathing load limits (max. 20 persons for each 1000 gallons of clean water), water temp. (5 ^{o}F less than athmospheric) could be adjusted to maintain the proper chemical and physical quality of a swimming pool. Cabins and showers are installed in the basement immediately accessible to the pool and the beach.

CHAPTER IV

DESIGN OF THE AUDITORIUM

Before any attempt is made to produce fancy architectural shapes, an investigation about the fundamental acoustic principles has been made and informations collected about auditoria known to be acoustically good. "Functionalism" and "Fancy" are both combined in the creation and final shaping of the auditorium.

Some acoustic hints in connection with the design of the auditorium. - most of the quotations in the following paragraphs (summarized to a minimum) in this chapter are from "Acoustics for Architects" - by E.G. Richardson. Illustrations are from texts on acoustics and auditoria.

Reverberation: Defined and worked out - " The gradual decay of sound in a room after the source of sound has been shut off is known as reverberation".

"Every syllable or musical chord must reach an adequate level of loudness at every point in the room and then quickly die away to make room for the next syllable or group of notes."

These are the two major principles on which the design is based upon; the first controls the kinds of materials to be used inside, their amount (superficial quantities) and the

dimensions of the hall. The second principle is made use of in the shaping of surfaces and the interior-exterior forms. (discussed in the paragraph under Distribution of sound.).

Professor W. C. Sabine of Harvard University argued and proved by his epock-making experiments that the"reverberation time (1) increased with the volume of the hall, other things being equal, since larger volume means sound waved spend longer time crossing it between reflections so that absorbing qualities act on it more slowly; also, reverberation time decreases as the total absorbent qualities of the room increase (with the size), since each reflection than dissipates a greater proportion of the sound energy. Thus, it will appear in the sequal that these two desiderata are actually antagonistic".

Based on Sabin's acoustic theories, which are basic to all acoustic design of halls, the "time of reverberation could be adjusted to the volume, (already set out), by altering the total absorption, to get the optimum (2) time for good hearing conditions.

(1) Time of reverberation: "The time between the cessation of the source of sound and the instant the loudness has fallen below the audible limit is known as the time of reverberation."

(2) As shown optimum time of reverberation varies for different kinds and sizes of halls.

So, the absorbing quality of different materials or surface - treatments is made use of to have "repercussions follow swiftly upon the heels of the direct sound to build up the general loudness or intensity" - see fig (7). The absorbing quality of some common building materials are shown in the table (p.14) of "Absorption Coefficients" (1)

In general, for plays, music and speech (as the auditorium for this project is intended to be), it would be best to have an average absorbent auditorium so as to make the time of reverberation as short as possible. "A very absorbent room is, in fact, very fatiguing to speak in, for sound is absorbed so rapidly that it is difficult to maintain sufficient overall loudness".

(1) "Absorption coefficient" of a surface is the fraction of the incident sound which is absorbed, the rest being reflected.

Absorption Coefficients

From: Acoustics for architectures E.G.Richardson
page 56

Material	C. 125 cycles/sec.	C. 500	C. 4000
Heraklith	0.050	0.050	0.060
Open window	1	1	1
Brick: unpainted	0.025	0.030	0.060
" painted 2 coats	0.012	0.015	0.025
Concrete or stone	0.01	0.015	0.015
Plaster or brick	0.12	0.02	0.05
" " wood lath.	0.025	0.03	0.035
Wooden floor	0.05	0.06	0. 20
Glass	0.035	0.027	0.02
Carpet	0.09	0.21	0.37
Curtains: velour 18oz/yd^2	0.05	0.35	0.35
cotton 14oz/yd^2	0.04	0.13	0,35
Asbestos: felt or tile	0.50	0.55	0.75
spray	0.60	0.60	-
Cork - 1" thick	0.15	0.40	0.2
Audience'	1.5	4.5	7.5
Seat: plain, unoccupied "	0.15	0.20	0.50
upholstered, unoccupied "	3.0	3.0	3.0

'Value/head depends on type of clothing

" Value /seat

Methods of calculation for finding optimum time of Reverberation and acoustic correction of the auditorium : (These methods are generalized and summarized after a detailed study of solved problems)[1] .

by Sabine formula $t = 0.05 \frac{V}{A}$

where t = Time of reverberation

V = Volume of hall

A = Number of absorption units

V and A should bear a definite relation to give the optimum t for the auditorium. This relation between V&A should be as follows: -

(a) For music alone -

$A = 1000 \quad 0.0225 \; V$

(b) For music & speech -

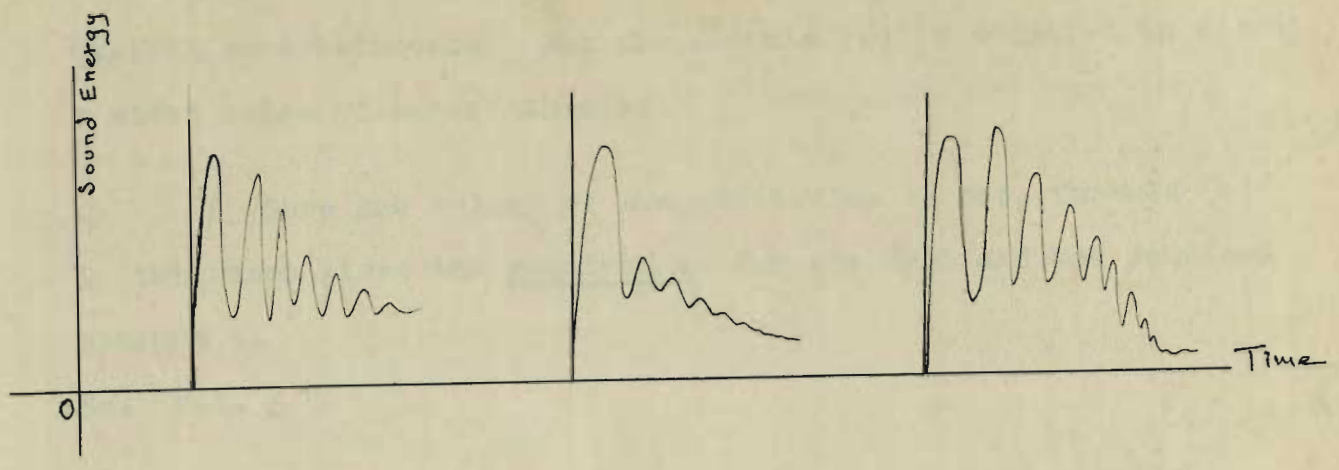
$A = 1000 \quad 0.027 \; V$

(c) For speech alone -

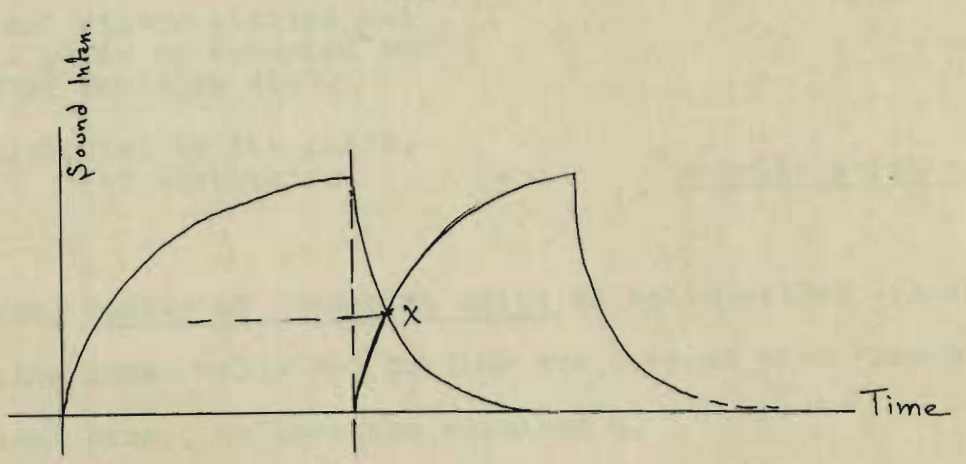
$A = 1000 \quad 0.033 \; V$

In the set of formulae above the least A is given by formula (a), resulting in a greater t , which means a more reverberant hall;

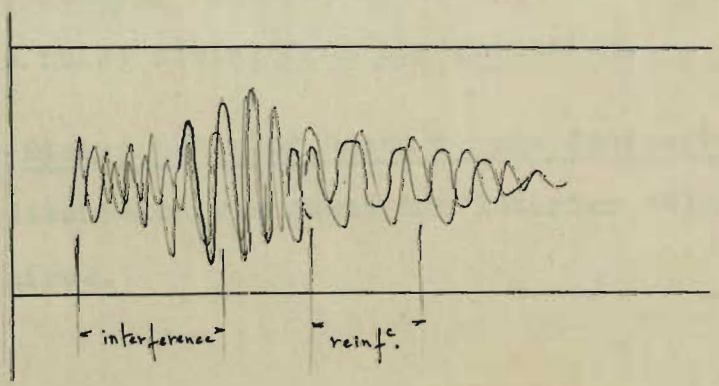
(1) In these methods of calculation dimensions should be in feet - sec.



- Fig 5



-Fig 6



-Fig 7

this condition is desirable if the hall is meant only for musical entertainments. But the formula (b) is selected to serve a wider range of entertainments.

Once the volume of the auditorium is set, formula (b) in this case gives the required "A" for the Hall and the required optimum t.

Eg. vol. = V

Surfaces		Absorption Units
(floor and window glasses and seats - plain or occupied and number of audience etc).		
each multiplied by its coeff. of absorption.	=	"a" units existing

Therefore, Number of absorbent units to be installed =(A-ab units) (1)

A- a being known walls and ceiling are covered with "Heraklith", to be used here , to have the required "t".

These methods of calculation apply for the lecture and conference Halls too. Heraklith is also helpful for sound insulation, particularly required in the Lecture or Conference Halls to reduce the noise coming from the gymnasium.

Distribution of Sound in the Auditorium: So far the author's discussion was about the interior adjustments for reverberation times.

In the shaping of the form of the auditorium sound intensity at different points inside the hall was the major consideration. The form as such, is intended to possess "expression" and"vigour". Here , as well as for the gymnasium hall, no particular style is adhere to; it is the free play of the imagination after scientific treatments.

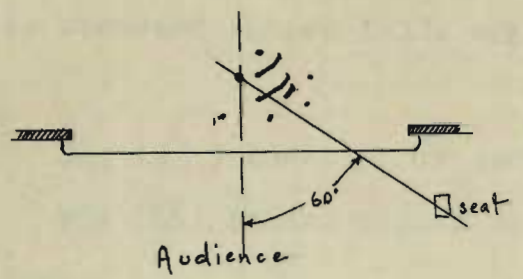
The effect of plain and curved ceilings, as well as of walls on sound waves is illustrated in ~~Fig~~ Plt. (11). As seen from the diagrams the best effects are produced from a parabolic reflector. This is the most approved shape by most acoustic authorities.

Optical adjustments in the Auditorium.

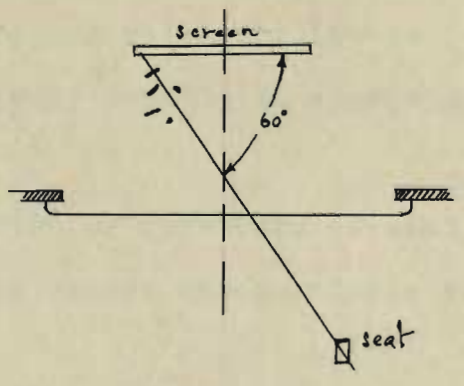
By now all adjustments were done for acoustics, based on theoretical results. While optical adjustments are mostly based on results from experiences and experts. The selected group of specifications here are mostly from "Theatres & Auditoriums" Progressive Architecture Library by Meyer & Cole.

Visibility Fig (8) The horizontal angle to the centre line at which objects onstage, upstage of the curtain line cease to bear intended relationship to other objects and to the background is approximately 60°. (60°).

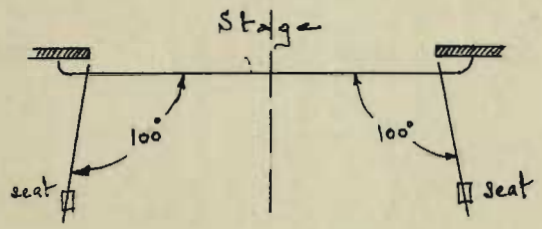
Fig. (10) Audience should not be located beyond a line approximately 100° to the curtain at the side of the proscenium.



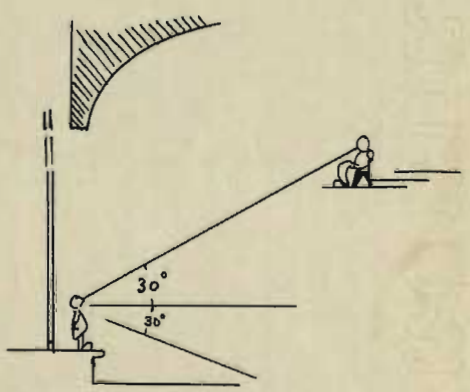
-Fig 8



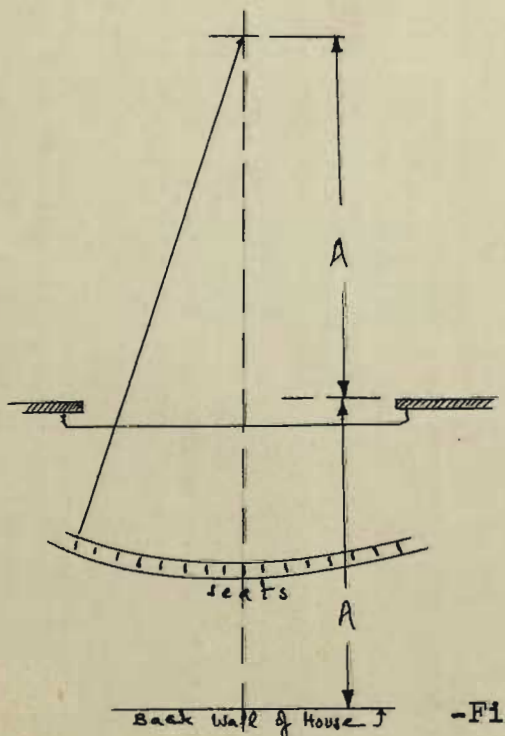
-Fig 9



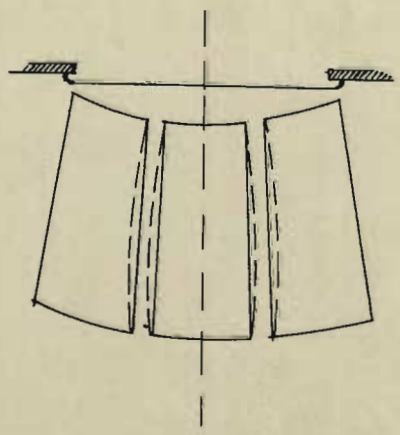
-Fig 10



-Fig 11



-Fig 12



-Fig 13

Fig (11?) vertical angle beyond which ability to recognize standard shapes falls off very rapidly is approximately 30^{o}.

Fig (12?) Location of centre of curvature of seat rows.

Fig (13) Radial aisles are always recommendable and so chosen here.

CHAPTER V

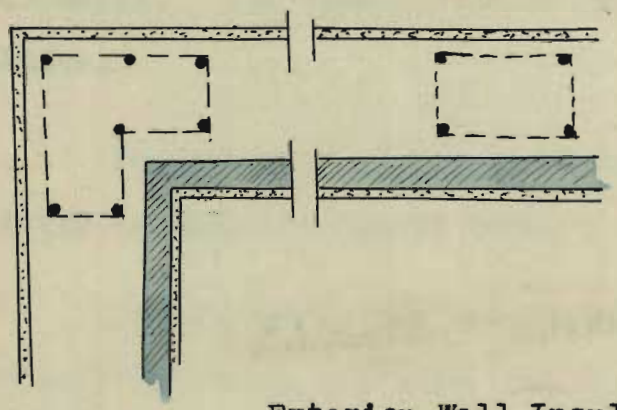
OF CONSTRUCTIONAL DETAIL

The general material for the construction of the building will be concrete. The exterior walls will be of cement blocks while for the interior partitions Heriklite (1) will be used its advantages acousticaly (in noise reduction and sound-proofing) and as an insulator are experimented and proved to be valid. Some of the details for its installation and method of rendering is shown in figs(14,15,16) taken from specification of the manufacturing company.

The warped surfaces of the auditorium and the gymnasium are to be cast in concrete. Some could be done on sight and some pre-cast.

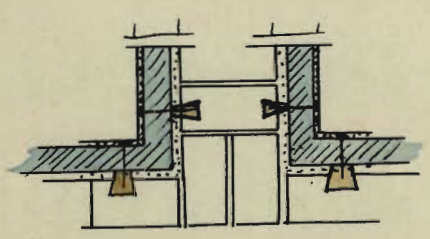
The ribs of the warped surface of the gymnasium is made use of for cantilever and beam action. The dome shaped and the parabolic lines in the auditorium are made use of for own dead loads. In both wind action (here negligible) will be reduced due to warped circular surfaces.

(1) A new Austro-American manufacture that lately arrived in Beirut. Four times lighter than cement-blocks. Price only one and a half times cement-blocks. Non-inflammable.



Exterior Wall Insulations

-Fig 14



Interior Wall Insulations

-Fig 15

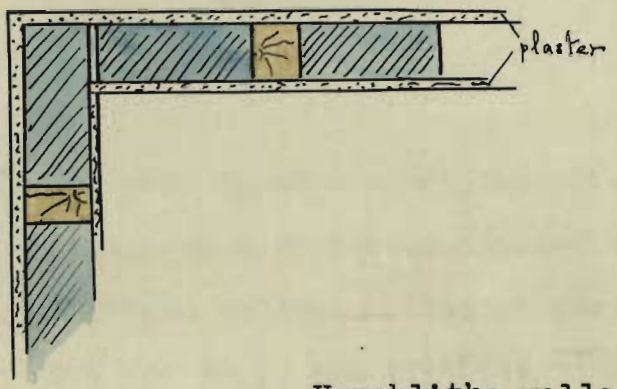
Heraklite construction
Heraklith in Blue
Thickness from 1 - 10 cm

Heraklite in the auditorium will be used for acoustic adjustments. The floors too of the auditorium may be of Heraklite.

The gymnasium floor is of hard wooden construction as specified in'Athletic Rules' text.

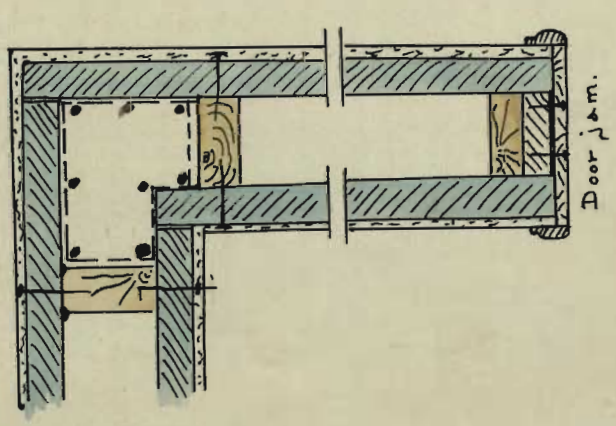
The floors of the lst story will be made of Heraklite after concrete slabs are cast, for noise reduction from the classes music and reading rooms to the quiet salon sections beneath.

The lecture and the Conference Halls are of double -wall Heraklite construction for complete sound-proofing.



Heraklithe walls for interiom
minor partitions

-Fig 16



Sound insulation for Lecture Hall
-Fig 17

Heraklith construction

Heraklith in blue
Thickness from 1 - 10 cm

EPILOGUE

" Too many schools of engineering especially have been notoriously limited in the range of their outlook. They go deep sometimes but not far; and if these times, outside the schools, were not so stimulating to minds gifted in dealing with mechanical and architectural problems, we will have a crop of minute specialists with too few to synthesize their specialties."

From "Design this Day" Teague
chapter on Beyond the rules.

SELECTED BIBLIOGRAPHY

NB.: The reader should note that the bibliography is not intended in any sense to be complete. The books listed here are those which gave most useful leads as regards data and dimensions for halls and rooms.

Book	Author
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2. Theatres and Auditoriums progressive arch. Library	Harold Burris-Mayer Edward C. Cole.
3. A.U.B. Athletic-rules collection	A.U.B. Athletic Dept.
4. Municipal and Rural Sanitation	Ehlers and Steel
b. Books-	
5. Building for modern man (a symposium)	Ed- Thomas H.Creighton
6. Design this day	Walter D. Teague
c. Magazines	
7 Architectural Record Issues of Facilities for athletics	July 1949 Issue
of houses	March 1951 Issue