A COMMUNITY SWIMMING POOL.

Pierre Siufi.

1953

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SCHOOL OF ENGINEERING

PROJECT REPORT

PROJECT ON

A COMMUNITY SWIMMING POOL

by Pierre Sioufi

submitted to:

The School of Engineering

American University of Beirut

April 27, 1953

COPY : letter of Authorization

21 June 1952

Mr. Pierre Sioufi,
c/o The School of Engineering,
A.U.B.,
Beirut,

Dear Mr. Sioufi,

My Board of Directors has considered your proposal of 6 June and finds itself in complete sympathy with the intent of your proposal.
However, it does not believe that it is justified in spending its funds for the development of a public garden which should properly be undertaken at public expense.

It is willing to retain you to design the swimming pool complete with modern filtration equipment which will satisfy the New York sanitary code.

This swimming pool should be designed as economically as possible since the Board requires that the net income from it shall retire the investment in 20 years.

I am instructed to retain you for this work and to request that you proceed with all possible dispatch.

Sincerely,

C. Ken Weidner

CKW/JK.

Letter of Transmittal

Pierre Sioufi,
A.U.B., Beirut,
April 27, 1953

Dean C. Ken Weidner,
School of Engineering ,
A.U.B.;
Beirut,

Dear Sir :

In reply to your letter of June 21, 1952, I have the honor to submit my project on a Community Swimming Pool.

This swimming pool is designed to accomodate 250 persons at one time. It is complete with modern filtration equipment. A bath house with wire basket holders for bather's street clothes, cubicles and showers is also provided.

The swimming pool is to be used in summer only for 110 days. The cost of the project is 580,600 Lebanese Pounds, with a 5% contingency. So, assuming an income of L.L. 27,500 per year, operating expenses not being included, the investment can be retired in 21 years. With a net income, the investment can be retired however in 25 years, which to my opinion should be the usual time for a such project.

Acknowledgment in preparing this project is due to most of the Professors of the School of Engineering, A.U.B., as well as to several friends and engineers where their confidence, aid and helpful suggestions have been a never-failing source of encouragement.

So, hoping for an approval, and awaiting for an answer in the nearest future,

Sincerely,

Pierre Sioufi

Pierre Sioufi

CONTENTS

CHARTS AND ILLUSTRATIONS

The author is greatly indebted to

Professor Walter Baggaley,
Mechanical Engineer, AUB ,

for his helpful, comprehensive, and stimulating suggestions, as well as his interest in the Project . . . .

SYNOPSIS

The importance of swimming-baths as an essential part of a planned community has been newly realized and future years will witness a rapid increase in the number of such centers in Syria. Aleppo, with a population of about 400,000 people, has now four swimming pools. These swimming pools, designed some ten years ago, are small and therefore cannot accomodate more than sixty people each, and besides they do not satisfy whatsoever any sanitary codes. These pools, of the fill and draw type, maintain the cleanliness of water by complete removal and replacement of the water at periodic intervals.

Aleppo, however, does not have enough water now, and this difficulty is more serious in summer where water is sometimes cut off completely at regular hours during the day to the consumers. Since swimming is practiced most in summer for about 110 days, due to the fact the winter weather is very cold, these swimming pools in order to have enough water and yet maintain its cleanliness, should either close in summer due to the lack of water, or reduce the extent of cleanliness of the water by allowing a longer time between fill and draw, the latter case being usually done now.

This project, a Community Swimming Pool, is designed to meet this problem. It is to be located in the Public Park of Aleppo, constructed and operated by the School of Engineering, AUB, they, being the agent for the Town Planning Commission Board for the Municipality of Aleppo.

This swimming pool is big enough to accomodate 250 persons at maximum load. It also solves the problem of lack of water by adopting the recirculation system. Water is recirculated from the pool through filtering and

sterilizing equipments and back to the pool at the rate of 3 turnovers per day, and only a small suffieient quantity of fresh water need be added from time to time to make up the evaporation losses and the loss that goes out through the scum gutters, as impurities to the sewer. Thus, it is seen that this system is economical and safe from the standpoint of sanitation.

The following pages are divided into four parts. The first part is an analysis of the plans of the swimming pool and bath house, submitted with the report. It describes what materials, equipments, furnitures, and facilities were selected and omitted. It also states the reasons why the various elements given above were selected or omitted. Some designs and suggestions for design are also given. The first part contains also a discussion on the chemical and bacteriological analyses of the water of Aleppo.

The second part is a Specification Book in sufficient details suitable for obtaining a preliminary bid for the construction of the pool and the bath house. In short, it describes and states materials and elements that shall be supplied by the Contractor for this construction, besides describing also the duties and responsibilities of the Contractor.

The third part covers the specifications for the furnishing of the necessary equipments with their piping systems, the floodlights, the necessary furnitures such as the baskets, telephones, flutter boards, and other safety devices. These specifications help the Client in purchasing and importing these equipments. The installation of these equipments, however, are to be done by the Contractor.

The fourth part of the report gives a preliminary estimate of the cost of constructing the pool and bath house and the purchasing and installing the various necessary equipments described and stated in the previous parts.

A summary that will show to the Client the time his investment would be retired with the net income derived, is also given in the fourth part.

Thirteen plans and some figures and illustrations are submitted with the report, and these will help the Client in deciding for an approval of the project, the Contractor for getting a preliminary cost estimate.

PART ONE

ANALYSIS OF

THE COMMUNITY SWIMMING POOL

*

* *

1. Location and Layout

A- The swimming-bath is essentially a place for recreation and enjoyment and for this reason, it is to be located in the public park of Aleppo so that first, it would be at the disposal of everybody, and second, it would be quite far from the neighboring dwelling houses which would limit its design and architecture.

B- The pool-surrounds for the use of bathers is 20 feet which is spacious enough for the use of bathers to walk around the pool or take a sunbathing.

C- Provision for a cafe is made all around the pool separated from it by a parapet wall 2 feet high with a galvanized railing pipe placed 1 feet above the wall.

D- A staircase leading to a second floor is provided in the building for a future expansion such as a night-club or a winter-cafe.

E- The layout or arrangement of entrances and exits of the pool room in relation to dressing rooms, showers, and toilets is such as to provide proper routing of bathers. Coming from the dressing room, a bather is required to pass the toilets, and go through the shower room before arriving at the pool entrance.

F- There is no connection between men's and women's quarters. Separate entrances and exits are provided.

G- For safety, entrances and exits are located at shallow water portion of the pool.

H- Ample room at the deepest water portion is provided for filters and other units. A trench is provided all around the pool with manholes at such intervals so that pipes, reflectors, and other fittings would be accessible for inspection and repair. These dimensions are shown in the Dra-

wing 7 of 13.

I- The access to the equipment room is through a ventilating room located at the end of the pool. This room is provided with a roof ventilator such as a Breindart made ventilator.

J- Removable slabs are provided at the deep water portion of the pool so that the filters or other units could be removed or placed from or to the equipment room.

2. Design and Construction Features

A- Shape - The pool is of rectangular shape with deep water near one end and shallow water at the other .

B- Dimensions - Length of the pool is 150 feet and width is 49 feet. Six lanes of 7 feet each are provided for competitive swimming.

C- Depth of water - For a distance of 100 feet, the depth ranges between 3'-3" at the shallowest portion to 5 feet at the deepest portion. Then for the next 40 feet, the depth ranges between 5 feet and 12 feet, and for the remaining 10 feet, the depth ranges between 12 feet and 10 feet. The greater portion of the pool is shallow, as seen, due to the fact that the pool is a public community pool so that most of the bathers would probably be non-swimmers, bathing just for the reason of having recreation, or having the enjoyment of being in water .

D- Slope of Bottom - The slope of the bottom of the pool where the water is less than 5 feet deep is 1 foot in each 57.14 feet, and there is no sudden change of slope within that area. On the other hand, a flat area on the pool bottom is avoided because such a flat area offers excellent lodging places for sediment .

E- Side Walls - The side and end walls are vertical for the reason that they, unlike the sloping sides, are not dangerous and can easily be kept clean .

F- Materials of Construction - The materials should provide a tight tank with smooth and easily cleaned surfaces. Reinforced concrete is used in the construction. To ensure watertightness, the following procedure is to be adopted :

(1) Good quality cement and a clean aggregate is to be used .

(2) A moderately rich mix is to be prepared, whose proportion is stated in the Specification Book .

(3) Vibrators are to be used to ensure a dense mix .

(4) The concrete is to be kept moist and protected from outside conditions for several days .

(5) On the concrete, a layer of a mastic coating such as Carey Thermotex B, supplied by the Philip Carey Mfg. Co., is to be applied. This coating consists of a combination of asbestos fibres and emulsified asphalt forming a cold plastic waterproof cement for application by trowel. This coating besides its waterproofing advantage, holds the tiles in place and provides the expansion and contraction of these tiles.

G- Construction Joint - Aleppo has a range of temperature of 40 degrees Centigrade between summer and winter. So, for this reason, one expansion joint is to be provided at the middle of the pool to ensure expansion and contraction in concrete work. This joint is formed in the floor and walls across the width of the pool. It should be watertight and yet allow free movement of the slabs. Its design will be made later in Detailed Drawings.

H- Details of Design - Though the project does not deal with a detailed

design, the author would like however, to give some recommendations or suggestions which were adopted in the project for making a Specification Book and a preliminary Cost Estimate, and which would help designers in later design work :

(1) Wall Design - The pond-wall is designed as a cantilever to withstand the water pressure in the bath and the pressure of the earth behind the wall in the part below the trench when the bath is empty. The trench around the pond eliminates most of the external earth pressure and, in addition, provides space for piping and other services and a means of access to under-water lighting reflectors .

(2) Floor Slab Design - Before the floor is laid, the site should be well drained and any loose ground consolidated by ballasting, thus ensuring that the bearing power of the foundation will be as uniform as possible. The slab thickness is 8 inches and proper reinforcement should be used. Some reinforcement should be provided at top for temperature. Beams should be provided at the breaking lines between the different slopes of the bottom of the pool. These beams will increase rigidity against any settlement of the earth below .

I- Pond Lining - Including bottom and sides up to runways, lining is of light green color tiles which present a smooth easily cleaned surface, demonstrate the clarity of the water and make the bottom of the bath visible to the bathers. Terrazzo tiles, 40 x 60 cm., and not glazed tiles, are selected due to the lower cost of Terrazzo. These tiles are reinforced due

to their great size and thickness. Tiling is applied directly to the mastic coating of Carey Thermotex B. The key is obtained by the use of " Keit " strips (fish-tailed rubber strips) which are placed in the mastic coating while it is warm and are later removed .

J- Markings - Swimming lanes are marked on the bottom with black tiles, spaced 7 feet apart and carried to 4 feet from each end of the pond. The outlet of the pool are to be marked with a black colored circle. Markings showing depths in 1 foot increments are used on both sides of the pool.

3. Quantitative Planning

Population to be served, the funds available, together with an estimate of the extent to which the facilities provided will be used, is of primary importance in deciding the size of bath required. Since swimming in Aleppo, with a population of about 400,000 , is available for a 4 months maximum period during the summer, and since there are no available existing sanitary swimming pools now, a pool 150 x 49 feet is chosen so that no rush and crowding occurs. Having the size of the pool, the capacity of the pool in persons can be found thus. According to the Reccommendation of American Public Health Association, the maximum capacity of the pool (persons) is :

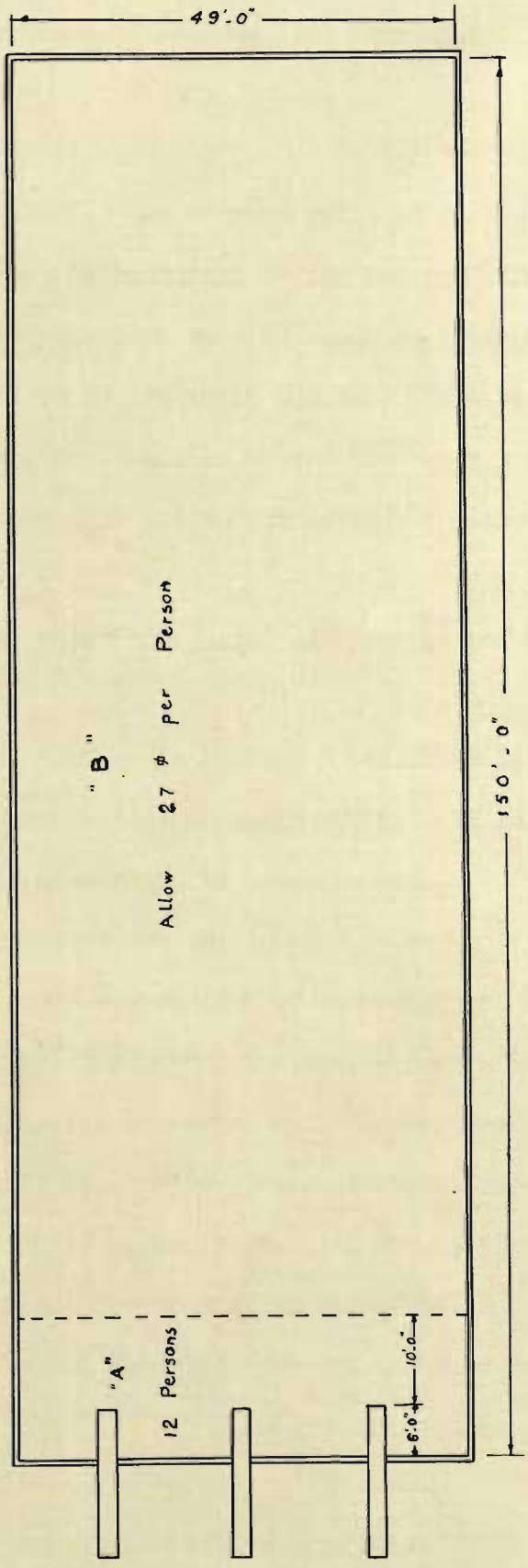
$$= 12 + \frac{\text{Area B}}{27} \qquad = 12 + \frac{\text{Total area} - \text{Area A}}{27}$$

Area A = 16 x 49 = 784 sq. feet

Area B = (49 x 150) - 784 = 7350 - 784 = 6566 sq. feet

$\therefore$ Capacity = $12 + \frac{6566}{27}$ = 12 + 243 = 255 persons

Illustration 1 . Quantitative Planning



Area A and area B are as shown on Page 6 . So, from the result shown , a capacity of 250 persons at maximum load is chosen .

4. Inlets and Outlets

A- Outlets are provided at the deepest point of sufficient size to permit the pool to be completely drained in 4 hours. Outlet openings of the grating in the floor of the pool such as shown in illustration 2 (figure 11 and 12) , supplied by the Permutit Company, might be used , where the opening is about four times the area of the discharge pipe to reduce suction currents. These openings are covered with a grating which is not removable by bathers .

B- Three outlets are provided, spaced as shown in the Drawing Sheet 10 of 13 .

C- Pipe connections as shown in Drawing Sheet 10 of 13 are provided in order to permit water be drained to the sewer as well as to the recirculation pump. No direct connection to sewer is made .

D- Inlets for repurified water are located as shown in Drawing Sheet 10 of 13 to produce a uniform circulation of water and the maintenance of a uniform chlorine residual throughout the entire pool without existence of dead spots. These inlets are submerged to reduce escape of chlorine odors.

E- Each inlet is to be designed so that adjustements are provided so as to proportion the volume of water required at the particular point to obtain the best circulation. Inlets such as shown in Illustration 2(figure 9 and 10), supplied by the Permutit Company, might be used .

5. Overflow Gutters

A- Overflow gutters extend completely around the pool. The design is

Fig. 9 MAIN INLET

Fig. 13 SCUM GUTTER DRAIN

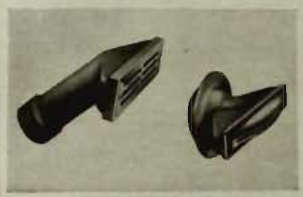


Fig. 10 MAIN INLETS

Fig. 14 SCUM GUTTER DRAIN

Fig. 11 MAIN DRAIN

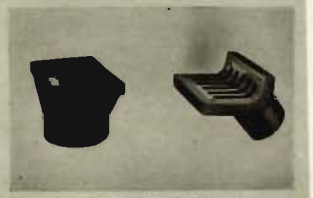


Fig. 15 SCUM GUTTER DRAIN

Fig. 12 MAIN DRAIN

Fig. 16 SUCTION CLEANER FITTINGS

Illustration 2 . Swimming Pool Fittings

such that matters entering them will not be washed out by a sudden surge of entering water, and that danger of bathers catching arms or feet in them is reduced to a minimum. The edge of the overflow gutter serves also as a hand hold for bathers, but deep enough that bathers' fingers will not reach to the bottom. The type of gutter chosen is also easily accessible for cleaning and inspection.

B- The spacing between the drainage outlets is shown in Drawing Sheet 10 of 13 and the gutter bottom is to pitch slightly to these outlets. The outlet pipes are 3 inches in diameter with outlets covered by gratings discharging into pipes 4 inches in diameter. Scum gutter drains as shown in Illustration 2 (figure 13, 14, and 15), supplied by the Permutit Company, might be used .

6. Ladders

A- Ladders are provided at the shallow, middle, and deep water portion, and on both sides of the pool, as shown in Drawing Sheet 7 of 13 .

B- The ladders are of Aluminum pipes because Aluminum is cheap, light, and does not rust. The steps are welded to the hand railing in order to minimize danger of accidents to the feet of bathers .

C- A hand rail on either sides at the top of the ladder leading out over the runway is provided. The dimensions are shown in Drawing Sheet 11 of 13.

7. Runways or Sidewalks

A- Runways are about 20 feet wide and extend all around the pool. The runway floors have a slope of about $\frac{1}{4}$ inch to the foot, and are constructed of non-slip Terrazzo reinforced tiles because these are smooth, can be easily cleaned, are hard-wearing, and are impermeable .

B- The runway drainage slopes toward floor drains spaced as shown in Drawing Sheet 10 of 13 .

C- The runway is separated from the pond by a raised coping as shown in Drawing Sheet 11 of 13 , to prevent surface-water dirt and rubbish from entering the pool. The height however, is 1½ inches, so chosen to reduce danger of accidental tripping.

D- Parapet walls 2 feet high with a galvanized railing pipe placed 1 foot above the wall (galvanized pipe is chosen to prevent rust) encircle the pool outside the runways. No trees or plants are provided just outside the runways because this leads to tracking of much dirt into the pool .

8. Spectators' Accomodation

The space used by spectators will be around the pool, separated from the runway by the parapet wall. There are no means by which bathers can enter space reserved for spectators or vice versa. Visitors' quarters have a separate entrance. The space used will be in a cafe arrangement of spacing, that is, tables and chairs would be provided. However, the cost of these accomodations is not included in the Cost Estimate because this space would be given later as a concession to a person who will also provide these accomodations. Public toilet rooms for each sex would also be provided as shown in Drawing Sheet 3 of 13 .

9. The Bath House

A- The Bath House is of Reinforced Concrete construction, with footings, columns, beams, and slabs. The walls however, are of hollow concrete blocks. Stucco as an external rough-cast will be used. Though most of the buildings

in Aleppo are either Rock Faced (Mubawaz) or Axed Dressed (Naheet) construction, the type of construction mentioned above is chosen because first,the ordinary Reinforced Concrete construction is cheaper than the Mubawaz or Naheet, and second, it fits better the surrounding level land than the Mubawaz construction .

B- The floor is of smooth, non-slip, and impervious Terrazzo tiling. The floor has a pitch of about $\frac{1}{4}$ inch to the foot, sloping to drains placed at intervals as shown in Drawing Sheet 3 of 13, to permit washing down with a hose .

C- Men's and women's quarters are separated by a tight partition. Walls 7 feet high, are placed at entrances and exits of dressing rooms to break the line of sight .

D- Partitions in the dressing rooms are of hollow concrete blocks, 7 feet high, to permit proper natural ventilation from the windows .

E- Doors and windows are of wood in order not to get rusted. Diamond mesh doors, galvanized after woven, are used at the main entrance and at exits to the pool. Turnstile doors are used in order not to let people by-pass the ticket seller .

F- Basket racks, baskets, are of diamond mesh wiring because they can be easily washed .

G- Hose connections are to be provided at the bath house and at such intervals for easy cleaning the bath house and the pool area .

H- Mixed swimming is provided for only one day per week because the habit in Aleppo now is that special days of swimming are reserved for men and special other days for women. So, the dressing rooms were designed so that they will not be used alternately by men and women alone on the special

days of swimming reserved to them respectively so that a maximum load of 250 bathers is assumed when designing the dressing rooms for each sex. Experience has shown also that people of Aleppo like privacy , but to reserve 250 cubicles for men or 250 cubicles for women while they are swimming would be uneconomical. So, following a system in which people would use the cubicles just for dressing and undressing and would use baskets for putting in their dress and return the full baskets to a delivery counter, the number of cubicles can be reduced and estimated as follows :
Assuming 100 bathers out of 250 bathers at maximum load ready to dress or undress, one group of 50 bathers can use the cubicles while the other group can wait some minutes for the time of dressing or undressing of the first group. So, 55 cubicles were provided for the men's quarters, and 68 cubicles for women's quarters, due to the fact that women take a longer time in dressing or undressing. Seats and mirrors were provided in these cubicles. The cubicles are of plywood with marine glue, and painted to permit washing. Plywood was preferred to steel due to economy and the fact that steel might rust in future. Dimensions of these cubicles are shown in Drawing Sheet 3 of 13 .

I- There is enough space where baskets can be put. Stools however, would be provided to reach the upper top baskets at time of maximum load .

10. Pre-Cleansing Rooms

A- Separate rooms are provided for both sexes. Ample drainage are provided and the walls are tiled with glazed tiles up to 6 feet high .

B- Showers in the proportion of one for each 40 bathers at maximum load are chosen so that 6 showers are provided for each sex. No hot water would

be provided because the pool will be used in the hot summer time only .

C- Toilet facilities in the proportion of one toilet for each 40 women and one toilet, and one urinal for each 60 men at maximum load are chosen, so that 6 toilets are provided for women and 4 toilets and 4 urinals for men . Urinals and toilets are so located that bathers will use them before entering the showers on their way to the swimming pool .

D- Lavatories in the proportion of one bowl to each 60 bathers at maximum load are chosen so that 4 lavatories are provided to each sex .

E- Foot baths are provided at the entrance to bathing areas for the purpose of preventing spread of Athlete's foot. They are built the full width of the hall and long enough so that they cannot be jumped over. A ½ % solution of chlorine would be maintained in the foot bath .

11. Heating, Ventilation, Lighting

A- Heating units for the bath house and for the pool are not provided because the pool is an outdoor pool and will be used in 4 months of summer only and cannot therefore be used in winter because it is very cold in winter .

B- Natural ventilation to the bath house is provided by means of a number of windows placed high enough so that first, a direct draft will not blow on bathers, and second, people from outside could not see through . The equipment room however, is ventilated through a ventilating room by means of a roof ventilator .

C- Artificial lighting is provided for the pool and the bath house because they will be used at night. The bath house is provided with ordinary pendent lighting. The pool however, is provided with overhead flood-

lights placed on posts just outside the runway to light the runway and the top part of the pool. Provision for future underwater lighting the pool is made by the construction of niches in the section of the pool as shown in Drawing Sheet 13 of 13 .

(1) Design for underwater lighting :

Width of pool : 49 feet

Average permissible lighting per sq. foot : 3 watts per sq. ft.

Let "s" be the distance between reflectors

Maximum spacing between reflectors allowed by the Illuminating Engineering Society is : 12 feet when depth is greater than 5 ft.

15 feet when depth is smaller than 5 ft.

If a 1500 watts lamp is used, $"s" \times \frac{49}{2} = \frac{1500}{3}$

$"s" = 20.4$ feet

but this is more than the allowable maximum spacing, so a 1000 watts lamp is used as seen below in the calculations :

If a 1000 watts lamp is used, $"s" \times \frac{49}{2} = \frac{1000}{3}$

$"s" = 13.6$ feet

From these calculations, we see that :

For 100 ft.(depth smaller than 5 ft.),the spacing should not be greater than 13.6 feet ; and for the next 50 ft.(depth greater than 5 ft.), the spacing should not be greater than 12 feet .

The Illuminating Engineering Society reccommends also that the first reflector should be at 6 feet from the deep end of the pool and $7\frac{1}{2}$ feet from the shallow end of the pool. So from all the

calculations shown above, 1000 watts lamps are selected, the spacing of the reflectors being shown in the Drawing Sheet 13 of 13 .

(2) Design for overhead floodlighting :

Length of pool and runway = 150 + 21 + 20 = 191 feet

Width of pool and runway = 49 + (2 x 20½) = 90 feet

Average permissible lighting per sq. foot : 1.25 watts per sq.ft.

If 6 poles are provided, the wattage necessary is :

$$191 \times 90 = \frac{X(\text{watts})}{1.25}$$

$$X(\text{watts}) = 21{,}487.5 \text{ watts}$$

∴ 22 lamps of 1000 watts each are selected, the total wattage being : 22 x 1000 = 22,000 watts

3 reflectors are provided at the end lamposts and 5 reflectors at the middle lamposts on both sides of the pool in order to provide a uniform lighting .

The height of the lamposts is calculated thus :

According to the reccommendation of the Illuminating Engineering Society, the spacing between the lamposts should not exceed 4 times the mounting height, therefore the height of the lampost should be :

$$\frac{191}{2} \div 4 = 23'\text{-}10\tfrac{1}{2}''$$

∴ We select the height as 25 feet , because 4 x 25' is greater than $\frac{191}{2}$ feet .

All the dimensions are shown on Drawing Sheet 13 of 13 . Floodlights such as those from the General Electric Co.,LTD., Model F 5735/6 and F 5737/8

which are designed for use with 200 - 1500 watt lamps might be used .

12. Recirculation System

A- The System - The recirculation system is provided for the pool. The procedure is as follows : The initial filling of the pool is accomplished with clean, sterile water, which is then continuously maintained in a pure state by recirculating it through purifying equipments. The size of the equipments to be used depends on the quantity of water to be purified, which in turn depends on the size of the pool and the number of times the water is to be completely recirculated per day. According to the reccommendations of the Second Congress of the Inter-American Association of Sanitary Engineering, held in Mexico in March 1950, the recirculation rate (turnover) is taken as three times a day. With this system, sufficient fresh water need be added to make the evaporation losses and the loss that goes out through the scum gutters. So this system is selected because it applies well to the condition of Aleppo since the waterof Aleppo is scarce. The principal units used are :

(1) Chlorinator - A look at the Water Analysis of Aleppo shows that the water is hard. So, free available chlorine is used instead of other chemicals such as hypochlorite solutions, chlorine and ammonia or bromine etc., for the pool disinfection. Its advantages over the others for the pool of Aleppo are :

a) - It kills bacteria in a short time .

b) - Prevents the production of nitrites which can be easily formed by the help of bacteria through the oxidization of the ammonia present in the water of Aleppo as will be shown later in the

Chemical Analysis of the water .

c) - Oxidizes any iron present to a form that can be easily filtered.

d) - Can replace copper sulfate for algae control due to the hardness of the water .

A chlorinator of the Semi-Vacuum Solution Feed Chlorinator, supplied by the Wallace & Tiernan Company, might be used .

(2) Hair Catcher - The hair catcher is a screening device situated on the suction side of the recirculation pump to remove hair, lint, before they reach the pump or filters. A 10 inches size as selected and furnished by the Permutit Company might be used .

(3) Recirculation Pump - A motor driven centrifugal pump is selected, driven by electricity since electricity is available and not very expensive. A pump having 650 GPM and 15 HP, as selected by the Permutit Company is used .

(4) Alum and Alkali Feed - The pressure solution type is used because the chemicals used, Sulfate of Alumina and Soda Ash, have a low cost, and the feeds while higher in initial cost, are more economical to operate than the other types. The function of the Alum is to coagulate finely divided matter into larger particles which can be readily removed by the filters while the Soda Ash added maintains alkalinity which is in part exhausted by the coagulant. An Alum charge of 160 pounds and an Alkali charge of 70 pounds as suggested by the Permutit Company is used. These feeds might be supplied by the Permutit Company .

(5) Filters - The filtration equipment consists of three vertical steel pressure units similar to the Permutit manual single valve filters and which might be supplied by the Permutit Company. Pressure filters were

chosen because they require less space and therefore can be installed in the provided equipment room. These filters have manholes at top to facilitate inspection and repairs. The manual single valve was chosen because it facilitates greatly the operation and therefore be comprehensible to any layman .

(6) Suction Cleaner - The suction cleaner is provided in order to remove dirt, hair, or any sediment settling on the bottom of the pool. The suction cleaner is operated by attaching it to the suction side of the recirculation pump. Suction cleaner fittings as shown in Illustration 2 (figure 16) and supplied by the Permutit Company, might be used .

(7) Water Heater - No water heater is provided because the pool will be used during the 4 months of summer only and the weather during these 4 months is hot enough that no further heating of water is necessary. This saves also in that no Water Softener would be used, the reason being that water which is hard (like the water of Aleppo), when heated will form objectionable lime deposits on the tiled walls of the pool. These deposits are hard to remove, the elimination of which would need a Water Softener.

B- Piping System - Cast Iron water pipes would be used on the discharge side of the pump because these pipes would be under pressure, while Cast Iron soil pipes would be used on the suction side of the pump because these pipes would not be under pressure. Cast Iron was chosen because first, it does not rust, and second, it is more economical in cost than galvanized steel pipes since the sizes of most or all of these pipes are more than 3 inches in diameter. The pipes have a diameter as shown in Drawing Sheet 10 of 13. These sizes were suggested by Professor Walter Baggaley, professor of Engineering at the American University of Beirut, and so selected so as

to reduce friction losses to a minimum. Piping used for different purposes will be painted distinguishing colors .

C- Test Kit - A test kit similar to a Permutit Test Kit will be provided to make chemical tests of the water to check the operation of the purification system. This test kit furnishes also a complete set of directions with it and will be installed in the Laboratory room, provided for in the bath house .

13. Spring Boards

A- The Spring Boards are rigidly constructed of Galvanized Steel pipes to prevent rust and are anchored at the bottom to the beams of the equipment room with a sufficient bracing to ensure stability under the heaviest possible load. The elevations, depths of water were so selected so as to follow the reccommendations of the American Public Health Association. These dimensions are shown in Drawing Sheets 8 and 9 of 13 .

B- The boards shall be painted and covered with cocoa matting .

C- The steps are $1\frac{1}{2}$ " x 3 " solid oak covered with rubber set on top of $\frac{1}{2}$ inch pipe rungs .

D- The lower flanges which are set in concrete are of brass .

14. Safety Precautions

A- For reducing to a practical minimum the danger of drowning, such devices as stated below will be provided :

(1) Five poles 15 feet long constructed of banboo and having at one end a blunt hook (shepherds crook)

(2) Four "flutter boards" each 1' x 3' x 2" capable of supporting in

water a weight of not less than 20 pounds .

(3) Five throwing ring buoys each having securely attached to it, a 60 foot length of $\frac{1}{4}$ inch manila line .

B- A first aid kit containing tincture of iodine, aromatic ammonia, bandages, cotton, .. etc. would be provided .

C- Four woolen blankets and a stretcher would be provided .

D- A First Aid room is provided in the bath house for emergency use .

15. Suits, Towels, and Caps

No provision have been made for suits, towels and caps because these would be supplied by each bather .

16. Chemical Analysis of the Water of Aleppo

The Chemical Analysis of the water of Aleppo, a copy of which is shown on Page 20, though dating from June 26, 1929, was received on March 18, 1953. Referring to a chemical formula :

$$\text{Organic Matter} \xrightarrow[\text{bacteria}]{O_2} \text{Albuminoid } NH_3 \xrightarrow[\text{bacteria}]{O_2} NH_3 \xrightarrow[\text{bacteria}]{O_2} \longrightarrow NO_2 \xrightarrow[\text{bacteria}]{O_2} NO_3$$

The chemical analysis shows that the water contains a total of 0.600,59 grams per liter of ammonia compounds. The ammonia has either come from the oxidization of organic matter with the help of bacteria(as seen from the formula above) indicating that bacteria exist but the final nitrite state did not reach (since we don't have nitrite in the chemical analysis), or it has come from other sources such as urine.

The chemical analysis shows also that we have some soluble salts in

COPY : The Chemical Analysis Of the Water of Aleppo (received on 18/3/53)

EAU ENVOYEE PAR LA Cie. D'ELECTRICITE

-:-:-:-:-:-:-:-:-:-:-:-

Echantillon N° 2, 18°

Puits - Vallée de Kouek - Ain Beida

Nitrites	Néant	
Ammoniaque saline	0,000.49	
organique	0,000.10	
Totale	0,000.59	
Chlorures (évalués en NaCl)	0,034	par litre
Chlorures (en Cl)	0,021	par litre
Matières organiques	0,002	
Sulfate (	0,078	en SO^3
Sulfate (	0,098	en SO^4H^2
Nitrates	0,009	
Carbonates	0,297	par litre
Degré hydrotimétrique total	29°	
Degré hydrotimétrique permanent	10°	
Plomb	Néant	
Cuivre	"	
Zinc	"	
Résidu sec	0,497	
Produits volatils	0,033	

Eau limpide, incolore, aérée, sans odeur, sans dépôt .

Eau potable, utilisable pour les machines, propre aux usages domestiques.

Excellente

Alep, le 26 Juin 1929

s/ Marcel Coret

water such as NaCl (sodium chloride) but these are little in quantity, and these salts expressed in terms of Cl (chlorine), or NaCl, cannot kill bacteria because the chlorine in them is ionic chlorine which unlike atomic or molecular chlorine cannot kill bacteria .

The carbonates however, which make the hardness of the water are present, but the extent is not too large .

17. Bacteriological Analysis of the Water of Aleppo

The Bacteriological Analysis of the water of Aleppo, a copy of which is shown on Page 22, was received on April 14, 1953. The bacterias present are responsible for the following diseases :

Colibacille - Intestinal disorder and Colicystitis

* Enterocoques - Enteritis and Intestinal disorder

* Salmonella - Typhoid and Paratyphoid

* Shigella - Dysentery

B. Perfrungens -

B. Subtilis -

Leptospire - Weil's disease

Virus de Polyomyelitis - Poliomyelitis

* Oeufs des Vers Intestinal - Intestinal parasites

* Oeufs du Bilharzia - Bilharziasis

The bacterias with a star (*) in front of them indicate that the water is polluted with feces. This analysis is not sufficient however, because it does not show the extent of contamination of water. For better understanding of water, a total E coli count should have been done which is used as a criterion to determine the extent of pollution of water .

COPY : The Bacteriological Analysis of the Water of Aleppo (received on 14/4/53)

The bacterias in the water of Aleppo are :

Colibacille

Enterocoques

Salmonella

Shigella

B. Perfrungens

B. Subtilis

Leptospire

Virus de Polyomyelitis

Oeufs des Vers intestinals

Oeufs du Bilharzia

PART TWO

SPECIFICATION BOOK

FOR THE CONTRACTER

*

* *

GENERAL CONDITIONS

1. Examination of Site .

The Contracter should satisfy himself as to the site, local facilities of access, and the location of the municipal dumps .

2. Materials and Labour .

All materials, labour, implements, tools, and transportation are to be supplied by the Contracter. Furthermore the Contracter is responsible for the installation of all machinery and equipment. The work is to be executed in the most workmanlike manner in accordance with the best rules of the trade, and all materials shall be the best of their several kinds .

3. Responsibilities .

The Contracter is to provide all temporary lighting, water, access roads and gangways, sheds, stores, sanitary arrangements, fire precautions and security, and stand at his own risk all dangers occuring to the workers as well as injury occuring to the neighboring buildings in the park. The Contracter should not allow also at any time any accumulation of waste, and on completion of the works, must leave the ground clean, free of rubbish, and any inflammable material .

4. Protection of Trees .

The Contracter shall not uproot or damage any trees on the Park without a written permission from the Municipality's agent .

5. Dimensions .

All dimensions shown on drawings shall be read as follows :

(a) Vertical dimensions linked to floor levels, refer to finished floor levels .

(b) Vertical dimensions linked to windows, refer to top of completed Masonry Sill .

(c) Vertical dimensions linked to ceilings, refer to soffit of ceilings without plaster .

(d) All horizontal dimensions, refer to walls without plaster .

(e) All dimensions given for doors and windows refer to openings in walls before frames are fitted .

I . EXCAVATION AND EARTHWORK

6. Excavation is in earth with an average depth of 2 meters for the bath house, and as shown in Drawing Sheet 7 of 13 for the pool. The price shall include for grubbing up and clearing away all shrubs, bushes, roots and excavating in all materials met with except rock .

7. For the excavation in rock, no blasting will be permitted without the permission of the Municipality's agent in writing .

8. The Contracter shall re-fill in around the foundations and under floors with good dry material selected from the excavations to the levels shown and carefully ram and consolidateadding water if necessary until complete consolidation is attained. The refilling shall be done in layers not exceeding 30 cms. in thickness .

9. Hardcore shall be of approved hard limestone, free from loam, clay or

organic matter. It shall be broken and graded between 5 cm. and 15 cm. and hand-packed, and the interstices filled with similar hard stone broken to a smaller gauge so as to form a level and even bed . Hardcore shall be thoroughly rammed, watered, and consolidated to a thickness of 8 cm. for the bath house and 15 cm. for the pool .

II. CONCRETE WORK

10. All cement used on the Works shall be fresh cement from the Chehba' Co. of Aleppo .

11. The Nahati (crushed stone) shall be clean, sharp, gritty, free from clay, organic matter or other impurities and should be thoroughly washed before use .

12. The aggregate used shall be hard sharp-edged broken stone from an approved quarry, free from earth, dust, loam, clay, organic matter or other impurities. No soft stone may be used. The grading of the aggregate shall be as follows :

(a) For Mass Concrete

50% to 60% Passing a 5 cm. sieve and retained on a 3 cm. sieve .
40% to 30% Passing a 3 cm. sieve and retained on a 1½ cm. sieve .
10% Passing a 1½ cm. sieve and retained on a ½ cm. sieve .

(b) For Reinforced Concrete

65% to 75% Passing a 3 cm. sieve and retained on a 1½ cm. sieve .
35% to 25% Passing a 1½ cm. sieve and retained on a ½ cm. sieve .

13. The proportions of concrete shall be as follows :

(a) Bath house

1- Reinforced Concrete under ground

Crushed stone	0.80 M.C.
Nahati	0.40 M.C.
Cement	300 Kg/M.C.
Iron	70 Kg/M.C.

2- Reinforced Concrete above ground

Crushed stone	0.80 M.C.
Nahati	0.40 M.C.
Cement	350 Kg/M.C.
Iron	90 Kg/M.C.

(b) Pool

1- Reinforced Concrete in slab

Crushed stone	0.80 M.C.
Nahati	0.40 M.C.
Cement	350 Kg/M.C.
Iron	80 Kg/M.C.

2- Reinforced Concrete in retaining walls

Crushed stone	0.80 M.C.
Nahati	0.40 M.C.
Cement	350 Kg/M.C.
Iron	70 Kg/M.C.

The aggregate nahati and cement shall in all cases be mixed in mechanical concrete-mixing machines. No hand mixing will be allowed .

13. Steel reinforcement shall be good grade mild structural steel of an approved and known provenance. The wire shall be annealed black wire at

least 1½ mm. in diameter. All mill scale, loose or scaly rust, shall be thoroughly cleaned off the reinforcement, with a stiff wire brush, before the reinforcement is placed in position. Steel for reinforcement shall not be oiled, painted or coated in any way. Any rod showing signs of cracking will be rejected .

14. The Contracter shall be responsible for the design, provision, suitability of all formwork and molds for concrete work .

15. The Contracter shall carefully set out one expansion joint at the middle of the pool. The surface of concrete shall be painted with bitumen, and bitumen sheeting of an approved thickness inserted between the existing and new surfaces. The thickness of joints will be chosen later in detailed drawings .

16. Reinforced Concrete slab shall be solid. Solid slab shall have two-way reinforcement. Slabs shall be cast integrally with all girders, beams or belts supporting them to form a monolythic mass .

The floor slab for the bath house shall be 7 cms. thick .

The floor slab for the deck of the pool shall be 10 cms. thick .

The floor slab for the pool shall be 20 cms. thick .

The ceiling slab for the bath house shall be 15 cms. thick .

The reinforced concrete retaining walls for the pool shall have dimensions as shown in Drawing Sheets 7 and 11 of 13 .

III. BLOCK WALLING

17. The Contracter shall supply and use hollow concrete blocks, of suitable sizes, 25 cms. for external walls and 15 cms. for internal wall

partitions. All partitions are to ceiling height except where noted in the Drawing Sheet 3 of 13 . The blocks shall be true to shape, sound and uniform in colour and size with straight edges, of best quality and manufacture produced in an approved factory .

18. The Contracter shall supply unslaked lime, produced in an approved lime-kiln and he will be permitted to excavate, at his own expense, a temporary pit for lime slaking .

19. The mortar shall consist of 300 Kg. cement to 1 M.C. of well graded nahati mixed with 90 Kg. of slaked lime to improve workability .

20. Blockwork shall be built one course of headers to one course of stretchers .

21. The Contracter is required to build the block walls first and then cast the columns in between .

22. The Contracter shall build a parapet wall 60 cms. high all around the runway around the pool as shown in Drawing Sheet 2 of 13 .

IV. PLASTERING

23. The internal plaster work shall be applied in two coats to a minimum and total thickness of 15 mms. on vertical faces and 10 mms on ceilings.

24. The external plaster work shall be applied in three coats to a total thickness of 20 mms.

25. The mortar for plaster work for internal application shall be composed of 300 Kgs. of cement to 1 M.C. of clean nahati with 90 Kgs. slaked to improve its workability . For external application, the mortar shall be composed of 350 Kgs. of cement to 1 M.C. of clean nahati and 40 Kgs.

slaked lime to improve its workability .

26. External rough-cast work shall be applied mechanically to a thickness of 10 mms. and it shall consist of 400 Kgs. white cement to 1 M.C. of a mixture of nahati and small limestone chippings and a colour of oxide.

V. TILING AND TERRAZZO WORK

27. The wall tiling to shower, toilet and public toilet rooms shall be white glazed tiles 15 x 15 cms. of the best make available in the country and of first choice. The tiling shall be to a total height of 180 cms. Tiles in end courses to have rounded edges. Internal and external corners to be tiled with quarter round tiles. The tiling shall be set with straight horizontal and vertical joints, bedded in 1:2 cement mortar and jointed in white cement. The walls which are to be tiled shall be screeded with 1:3 cement mortar. The surface of the screeding shall be left slightly rough .

28. The floor tiling to bath house shall be grey coloured Terrazzo tiles 20 x 20 cms. of the best make and shall be laid on a bed of nahati 2 cms. thick and solidly bedded in mortar 1.5 cms thick. The rates shall include for executing all cuttings and notchings required. Joints shall not exceed $\frac{1}{2}$ mm. in thickness .

29. Terrazzo skirting tiles, together with internal and external angle tiles, returns and end tiles, shall be supplied by the Contracter .

30. The Contracter shall fix all tresholds, steps (which include the treads, risers and sloping terrazzo skirting) as will be shown later in detailed drawings .

31. The floor tiling of the pool and the runway shall be light green coloured Terrazzo tiles 40 x 60 cms. and 4 cms. thick of the best make . The lane markings shall be black coloured. The tiles shall be reinforced and shall be laid on a bed of mastic coating 1 cm. thick. Carey Thermotex B shall be used as the mastic coating .

32. The wall tiling of the pool shall be light green coloured Terrazzo tiles 40 x 60 cms. and 3 cms. thick of the best make. The tiles shall be reinforced and shall be laid on a bed of Carey Thermotex B coating 1 cm. thick .

33. The Contracter shall supply and lay in situ Terrazzo all around the pool through the scum gutter drain and the raised ledge. The colour shall match the light green colour previously specified. The cast-in-situ Terrazzo work shall be made in two coats .

VI. ASPHALT AND DAMP PROOFING WORK

34. Lay to a thickness of 1 cm. a waterproof course of Carey Thermotex B between the concrete bottom slab of the pool, the reatining walls of the pool and the tiling above. This coating shall be applied by trowel in two coats and it consists of a combination of asbestos fibres and emulsified asphalt forming a cold plastic waterproof cement .

35. Lay to a thickness of 1 cm. a waterproof course of Carey Thermotex B under the tiling of the sidewalk of the pool and run the waterproofing to walls and up and have curb at pool entries. This coating shall be applied by trowel in two coats .

36. Lay to a thickness of 1 cm. a waterproof course of Carey Thermotex B

between the retaining walls of the equipment room and the earth behind. This coating shall be applied by trowel in two coats .

37. Lay over the roof of the bath house to a finished thickness of 1.5 cm. a waterproofing layer of Carey Thermotex B. This layer shall be applied in two coats, by trowel. Then, a layer of a mix of sharp nahati and small chippings shall be added and rolled with a hand roller. The waterproof course shall extend to a skirting of not less than 15 cms. of height and shall be well connected to the waterproof course in the parapet walls .

VII. JOINERY AND CARPENTRY WORK

38. The Contracter is to supply all materials, articles, fittings, and all ancillary materials for fixing such as glue, screws, bolts, holdfasts , .etc., and workmanships necessary for the completion of the work according to the following specifications .

39. All timber shall be sound, well seasoned, well cut, and free of deformations, knots, or cracks. There shall be no sign of rot, worm or other infestation in the timber and it should be of first grade quality .

40. All windows and interior doors are of katrani wood .

41. All exterior doors shall be of iron except the main entrance door and the entry doors to the pool where they shall be of diamond mesh galvanized after woven .

42. The Contracter shall supply and install two turnstile doors at the dressing rooms for exits to the entrance hall as shown in Drawing Sheet 3 of 13. These doors shall consist of 4 rows at 90° of steel rods

placed at 6 inches intervals on a post. A fifth row would be embedded in the wall .

43. The Contracter shall supply and install a railing to the parapet wall all around the sidewalk of the pool. The railing shall be galvanized steel pipe .

44. The Contracter shall supply and fix diamond mesh basket racks to the bath house. The mesh should be 2 mms. in thickness, galvanized after woven .

45. The Contracter shall supply and fix partitions for the dressing cubicles, toilet and shower stalls. These partitions shall be 4 cms. thick with 2 layers of 5 mms. plywood with marine glue .

46. All hardware, door furnitures, shall be the best of their several kinds. They shall be fixed with screws, bolts, nuts, ..etc. of the same finish as the article .

VIII. GLAZING

47. The Contracter shall supply all glass, putty, nails, dowels, clips etc. and all labour, transport, tools and everything necessary for the execution of all glazing. All glass shall be 3 mms. thick and shall be clear, free of all irregularities, air bubles and other defects. Frosted glass, shall be grooved with vertical parallel grooves. All glass to windows and doors shall be frosted glass .

48. The putty shall be prepared from whshed whiting and boiled linseed oil of the best quality procurable, well kneaded together and with a proportion of not less than 10% of white lead ground in oil worked into it

during preparation. Only best quality linseed oil putty shall be used in wooden frames. For steel frames, red oxide shall be used .

49. Mirrors shall be of first grade plate glass beveled and well finished and shall be fixed with at least four screws each in an approved manner. All screws to have chromium-plated heads. Each cubicle shall have one mirror .

IX. PAINTING AND DECORATION

50. The Contracter shall supply all paints, distemper, varnishes, primers etc., ready mixed in sealed containers as sold by approved manufacturers.

51. The interior walls of the bath house and the equipment room shall have first one coat of whitewash, then one coat of soap shall be applied after the whitewash is dry, and after the soap solution, distemper with a light green tint shall be applied .

52. For external walls, one coat of whitewash is applied first, followed by one coat of soap solution. Then distemper with a creamy tint is applied with an extra coat of washable Distemper paint containing casein.

53. Joinery work in doors, windows and partitions of the cubicles shall be oil painted. A primary coat is first applied followed by two coats of oil paint and one coat of finishing .

54. Oil paint on metal shall be applied thus. First two coats of red lead are applied followed by two coats of selected oil paint .

55. The Contracter shall also paint the piping of the recirculation system, pipes having different purposes will be painted distinguishing colours .

56. The Contracter shall also apply one coat of paint to the outside of the filter shells .

X. DRAINLAYING

57. The Contracter shall excavate a trench all around the pool with manholes at intervals as shown in Drawing Sheet 2 of 13. The trench shall be 3'-0" x 3'-5" enough for inspection and repair work to the piping system, accessible through the manholes. The faces of the excavation shall be upheld by a layer of concrete 9 inches thick. The bottom of the trench shall be 8 inches thick.

58. Concrete shall be packed in under drain pipes for the bath house and at least half way up the sides .

59. Bends at the feet of soil and vent pipes shall be bedded on concrete bed 45cm. x 45cm. x 10cm. and haunched up to a height of 15 cms.

60. Cast iron frames and covers of a special "Anti-Malaria" type shall be provided for every manhole and shall be bedded in 1:3 cement mortar .

61. Fresh air inlets shall consist of 185 cms. length of 5 cms. galvanized screwed ventilating pipe finished at top with a fly-proof fresh air inlet of approved design .

XI. PLUMBING

62. The Contracter is responsible for the supply and fixing of all sanitary fixtures, piping, fittings, stop cocks, ball cocks, jointing materials, nails, wall hooks etc. to the bath house .

63. All water pipes to the bath house to be screwed socketed "Strong" quality galvanized wrought iron tubing with all necessary fittings, wall hooks etc.

64. Soil and vent pipes to the bath house shall be 4 inch cast iron pipe for the soil pipe and 2 inch for the vent pipe with socket and beaded spigot ends, sound, straight true in shape and free from cracks. The whole of the stacks are to be carried 1 metre above parapet as ventilation pipes. Inspection eyes with covers and bolts are to be provided at all angles, junctions, bends etc.

65. Waste pipes from sanitary fittings of the bath house to junction with vertical stack shall be of 2 inch G.I. piping with screwed joints and fittings of the sanitary type, and provided with inspection eye at every bend or junction .

66. Cast iron bends to be provided at bottoms of stacks. These will be connected to inspection chambers and manholes with cast iron piping .

67. Asiatic toilets where shown in Drawing Sheet 3 of 13 shall be vitreous china squatting pans of the best make available and provided with an integral connection for flush pipes .

68. Pedestal toilets where shown in Drawing Sheet 3 of 13 shall be vitreous china washdown pedestal pans with bakelite seats and covers .

69. Flushing tanks are cast iron "Niagara" type over-head 3 - gal. tanks.

70. Lavatories as shown in Drawing Sheet 3 of 13 shall be enamelled fire clay wash hand basins, sizes 60 x 42 cms. and resting on G.I. brackets fixed to walls. Lavatories shall have glass shelves and mirrors .

71. The Contracter shall supply and install a service sink in the utility room. The sink shall be of enamelled fire clay .

72. The Contracter shall supply and install chromium plated shower fitting as shown in Drawing Sheet 3 of 13 .

73. Wall urinals are to be of the best enamelled fire clay and placed where indicated in Drawing Sheet 3 of 13 .

XII. ELECTRICAL INSTALLATIONS

74. The Contracter is to supply all materials necessary for the electric installation, conduits with fittings, distribution boxes, insulated wires, fuses and fuse boards, switches, sockets, push buttons, electric bells and transformers, clips and all fixing materials and every thing necessary for the completion of the work .

75. All conduits shall be laid under plaster, and the necessary channels, recesses and openings shall be provided while the building is under construction and before the concrete is cast .

76. The Contracter shall install and fix the installation of the overhead floodlighting reflectors around the runway of the pool as shown in Drawing Sheet 13 of 13. These reflectors shall be supplied by the Client.

77. The bath house, the equipment room, and the ventilating room shall have ordinary pendent lighting .

XIII. MISCELLANEOUS

78. The Contracter shall supply and fix all the materials necessary for the springboards. The pipes of the springboards shall be galvanized steel pipes well anchored to the beams of the equipment room below. The

diameter of these pipes are shown in Drawing Sheets 8 and 9 of 13 . The boards shall be painted and covered with cocoa matting. The steps shall be 1½" x 3" solid oak covered with rubber set on top of ½" pipe rung. The lower flanges which are set in concrete shall be of brass .

79. The Contracter shall supply and fix six ladders for the pool as shown in Drawing Sheets 7 and 11 of 13. The ladders shall be of aluminum pipes. The steps shall be welded to the handrails .

80. The Contracter shall supply and install a roof ventilator such as a Breidart made ventilator to the ventilating room. This ventilator shall be 8 inches in diameter with a motor driven fan .

81. The Contracter shall install the following in the most workmanlike manner in accordance with the best rules of the trade :

A chlorinator, a hair catcher, a recirculation pump, alum and alkali feeds, three vertical filters as well as the piping and plumbing of the pool. These equipments with the pipes and their fittings shall be supplied by the Client .

PART THREE

SPECIFICATION BOOK

FOR THE CLIENT

*

* *

These Specifications cover the furnishing of the necessary equipments, the piping to the equipments, the floodlights, the necessary furnitures such as the baskets, telephones, flutter boards and other safety devices etc.

I. EQUIPMENT

1. These specifications cover the furnishing and the import of the necessary equipment required for recirculating, filtering and sterilizing the water in a 49 feet wide, 150 feet long swimming pool, having a capacity of approximately 316,000 gallons and based on an eight hour turnover .
2. The various parts of the equipment required for the installation,namely: Filters, Chemical feeds, Chlorinator, Recirculation pump and motor, Hair catcher, Suction cleaner, Special fittings,etc. shall be purchased from an approved manufacturer who must have had no less than five years previous successful experience in furnishing similar equipment. Equipments from The Permutit Company or from The Wallace & Tiernan Company might be used . The manufacturer shall furnish detailed drawings as well as a guarantee to the purchaser that the equipment is of the correct capacity without any defect .

A--Filters

3. The filter battery shall consist of three vertical steel pressure units. Each unit shall be not less than 10 feet in diameter. The combined capacity of the filter units shall be 42,300 gallons per hour when operating at a filtration rate of 3 gpm per square foot of filter bed surface .
4. Filter shells shall be fabricated with high grade tank steel. Each

filter shall be equipped with the necessary flanges and connections for filter main piping system. Each unit shall be furnished with a manhole of the standard 11" x 15" size, placed in the top head .

5. Each filter shell shall be supported on four jack type ball and socket supports securely attached to the filter .

6. The filters shall be provided with all the necessary pipe, valves and fittings to make a complete battery from inlet to outlet. The piping shall be arranged to carry out all the operations of filtering, backwashing, filtering to waste and draining. The filters are to be equipped with a single manually operated multiport valve .

7. The filters shall be equipped with automatic air relief valves on each filter unit, loss of head pressure gauges, sight glass and sampling cocks.

8. The filters shall have a deflector distributor filtered water collecting system, so designed as to uniformly collect the filtered water throughout the entire cross section of the filter and with a backwash distributing and collecting system .

9. Each filter shall be equipped with suitable grades of aggregate to a depth of at least 42 inches .

10. The outside of the filter shells shall be protected with at least one coat of oil paint before shipment. The finishing coat will be provided and applied by the purchaser .

11. A mechanical rate-of-flow indicator shall be provided on each filter, capable of indicating flows in either direction of filtering or backwashing. The indicator shall read in gallons per square foot per minute and shall indicate the load carried by each filter and the pump recirculating rate . No mercury shall be required for the operation of the rate-of-flow indicator .

B- Chemical Feeds

12. The feeding of alum sulfate and soda sah shall be accomplished by a continuous proportionating device capable of adjustment to meet varying water conditions. The chemicals shall be fed in the form of a 10% solution. Equipment shall be constructed of materials capable of resisting the action of the chemicals contained or conveyed therein. The equipment supplied shall consist of :

One pressure solution feed, having a capacity of 160 pounds of alum sulfate in 10% solution .

One alum sulfate solution mixing tank, of such size that above solution can be readily made up .

One pressure solution feed, having a capacity of 70 pounds of soda ash in 10% solution .

One soda ash solution mixing tank, of such size that the above solution can be readily made up .

Complete accessories for the above including :

Gauge glasses .

Indicator to indicate the rate of feeding chemicals .

Needle and operating valves .

Necessary shunt piping .

Means shall be probided for the positive dilution of the chemical solutions before they are added to the main stream of water .

C- Testing Outfit

13. A test set shall be provided for the determination of the methyl orange alkalinity and the free CO_2 together with instructions for making these tests. The instructions shall be such that an operator, having no

technical knowledge, shall be able to make accurate field tests of the water in the swimming pool .

14. A slide comparator, complete with permanent colored standards, complete glassware, reagents and instructions, shall be furnished in a cabinet for readily determining the pH and chlorine content of the pool water. The color ranges of the standards shall be complete for both pH and chlorine tests and the standards shall be permanently mounted in a bakelite slide .

D- Chlorinator

15. A chlorinator of the Semi-Vacuum Solution feed, equipped for either manual or automatic start and stop operation, shall be supplied for feeding chlorine to the recirculating pool water. All accessories including chlorine tubing, diffuser, etc., shall be furnished. The manufacturer shall furnish also a set of instructions for the care and use of the equipment .

E- Recirculating Pump and Motor

16. The circulation of the water from the pool through the filters and back again is effected by a horizontal split double-suction centrifugal pump with a capacity of 650 gallons per minute. The pump shall be fully bronze fitted and equipped with ball bearings. It shall be complete with all accessories and shall be mounted on a cast iron, drip rim baseplate and direct connected by a flexible coupling to an electric motor .

17. The motor shall be of the ball bearing type, fan cooled, 15 hp., and capable of running continuously without undue heating, sparking or overload and designed for long life in a moist atmosphere. A pump supplied by the Fairbanks-Morse Company might be used .

F- Hair Catcher

18. One 10" size hair catcher shall be supplied for the suction line of the recirculating pump, with an extra strainer of noncorrodible material and a compound vacuum pressure gauge. The hair catcher shall have a yoke top, which is readily removed and replaced, to facilitate the cleaning of the strainer basket. The body of the hair catcher shall be close grained cast iron and the strainer shall be brass .

G- Suction Cleaner

19. A "large" size suction cleaner shall be provided to cleanse the bottom of the pool without resorting to draining it. This cleaner shall consist of the following :

One 24" cleaning tool with nozzle and handles, with 22" adjustable brush, hard rubber rollers and swivel connection .

250 feet of rope .

One 50 foot length of 2" diameter rubber lined and rubber covered suction hose, with smooth tapered bronze terminals .

Six bronze inlet fittings, smooth tapered, threaded with male thread for 2" pipe with 3" hub length, together with a bronze inlet plug, tapered smooth to fit the inlet .

Seven copper floats, with clamps for attaching to the rubber hose .

H- Swimming Pool Fittings

20. The filtered and sterilized water is returned to the pool through 22 2-inch inlet fittings. These fittings shall be made of cast iron bodies with chromium plated brass strainer plates. They shall be set in the walls of the pool 10" below the water line and as shown in Drawing Sheets 10 and 11 of 13 .

21. On the center line of the deepest end of the pool, and as shown in Drawing Sheets 10 of 13, three 6" main outlets shall be supplied . These outlets shall consist of cast iron bodies with chromium plated brass strainer plates .

22. Thirty six 2" scum gutter drains, spaced equally around sides and ends of the pool, shall be supplied. These fittings shall have solid brass bodies, made of brass castings, with chromium plated brass strainer plates, approximately 2" x 4" .

23. Thirty six 2" floor drains, spaced equally around sides and ends of the pool, shall be supplied. These fittings shall have solid brass bodies, made of brass castings, with chromium plated brass strainer plates.

I- City Makeup Tank

24. A 3'0" diameter by 5'0" high steel tank, made of $\frac{1}{4}$" plate properly supported, shall be furnished with a city water connection over the top of the tank. The city line shall be equipped with a stop valve and a positive operated tight shutoff float valve. The tank shall have a 3" flanged opening near the bottom for a valved pipe connection to pump suction line .

J- Piping System

25. Cast iron water pipes shall be used on the discharge side of the pump and cast iron soil pipes shall be used on the suction side of the pump . The diameters of these pipes, namely the inlet, outlet, scum gutter, suction cleaner and sewer pipes, are all shown in Drawing Sheet 10 of 13. These pipes shall be painted distinguishing colours by the purchaser .

II. FLOODLIGHTS

26. For the lighting of the runway and the top part of the pool, 22 floodlights shall be supplied, having lamps of 1000 watts each. The reflectors such as those supplied from the General Electric Co.,LTD., Model F 5735/6 and F 5737/8 which are designed for use with 200 - 1500 watt lamps, might be used . These reflectors have enamelled spun metal housing, finished white inside and green outside, fitted with domed heat-resisting front glass. They are supplied complete with lampholder, wrought iron cradle and cast iron base. A wire net over the front glass is included .

III. SAFETY DEVICES

27. Five poles 15 feet long constructed of bamboo and having at one end a blunt hook (shepherd's crook) shall be provided .

28. Four "flutter boards" each 1' x 3' x 2' capable of supporting in water a weight of not less than 20 pounds shall be provided .

29. Five throwing ring buoys each having securely attached to it, a 60 foot length of $\frac{1}{4}$" manila line shall be provided .

30. A first aid kit containing tincture of iodine, aromatic ammonia, bandages, cotton, etc., shall be provided .

31. Four woolen blankets and a stretcher shall be provided .

IV. MISCELLANEOUS

32. Two telephones shall be provided to the bath house, and two others to the pool. These shall be furnished by the Telephone and Telegraph Co. of Aleppo and installed by them .

33. Diamond mesh, galvanized after woven, baskets, 550 in number, and 1½mm. in diameter, shall be supplied to the bath house.

34. Six stools shall be provided to the bath house to reach the upper top baskets at time of maximum load .

PART FOUR

PRELIMINARY COST ESTIMATE

*

* *

The Bill of Quantities shall be divided into two parts, one part to be estimated by the Contracter, and the other part to be estimated by the Client. It is assumed also that the land which is located in the Public Part of Aleppo, and which has an area of 5,500 square metres, shall be donated by the Municipality for the purpose of building the Community Swimming Pool .

I. CONTRACTOR'S ESTIMATE

ITEM	DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT L.L.
1	Building the Bath House . This shall include the following works: Excavation,Concrete,Block walling,Plastering,Tiling, Waterproofing,Carpentry Glazing,Painting,Drainlaying,Plumbing and Electrical installations. The price includes also the building of the ventilating room,the parapet wall with the railing around the pool and the supply and installation of basket racks to the	696	M^2	65.00	45,200

ITEM	DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT L.L.
	bath house .				
2	Joinery and Carpentry Work of 153 cubicles .	510	M^2	35.00	17,850
3	Painting of 153 cubicles on 2 sides .	1,020	M^2	3.00	3,060
4	Mirrors 50x40 cms. in 123 cubicles .	123	Nº	15.00	1,840
5	Excavation of pool,trench, and equipment room .	2,304	M^3	3.00	6,900
6	Concrete work to the pool, trench,and runway .	491	M^3	85.00	41,700
7	Plastering of equipment room .	150	M^2	2.50	375
8	Tiling the floor,wall of pool and the runway .	1,850	M^2	10.50	19,450
9	Mastic coating under the tiling to the floor,wall, of pool,equipment room and the runway .	2,000	M^2	3.00	6,000
10	Distemper of the walls of the equipment room .	150	M^2	1.00	150
11	Supply and installation of 3 Spring Boards and 6 ladders .				1,500

ITEM	DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT L.L.
12	Supply and installation of a roof ventilator to the ventilating room .				100
13	Installation of the recirculating,filtering and sterilizing equipments with their piping system .				50,000
14	Painting of the piping systems and the filters .				1,000
15	Installation of the floodlights at the runway of the pool .				2,175
16	Profit and Expense of the Contracter,15% of the above 15 items .				29,600

Total Contracter's Estimate . . . . . .L.L. 226,900

II. CLIENT'S ESTIMATE

17	Recirculating, filtering and sterilizing equipments with their piping systems,based upon using American equipments .	350,000
18	22 floodlights to the runway of the pool,	1,200

19 .	Safety devices, such as ring buoys etc., and miscellaneous furnitures such as 4 telephones, 550 baskets . etc.	2,500
	Total Client's Estimate	L.L. 353,700
	∴ Total Cost of Project	L.L. 580,600

CONCLUSION

From the above calculations, it is seen that the building of the swimming pool, complete with filtration equipments and a bath house would cost 580,600 Lebanese Pounds with a 5% contingency.

Since the pool is to be used by 250 bathers daily for 110 days of summer which is the usual swimming season in Aleppo, the gross income per year, operating expenses not being included, would be 27,500 Lebanese Pounds (110 x 250 x 1.00 = 27,500) , where the entrance ticket to the pool is 1.00 Lebanese Pound per person. The investment therefore can be retired in 21 years. If however, operating expenses are estimated for 4,500 Lebanese Pounds yearly, and an income of 500 Lebanese Pounds yearly received through the concession of the provided Milk Bar, the net income yearly would be 23,500 Lebanese Pounds, the investment being retired in 25 years, which to my opinion should be the usual time for such a project.

BIBLIOGRAPHY

Booklets

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Design, Equipment and Operation of Swimming Pools and other Public Bathing Places.

2) The American University of Beirut
Specifications for Building and Grounds.

3) The General Electric Company
Floodlights and Floodlighting.

4) Institution of Civil Engineers
Journal of the Institution of Civil Engineers, December 1950

5) Mathieson Chemical Corporation
Hypo-Chlorination of Water.

6) The Permutit Company
Permutit Swimming Pool Equipment.
Booklets on Swimming Pool Sanitation and Safety.

7) The Portland Cement Association
Concrete Swimming Pools.

8) Sweet's File Catalog - Engineering

9) Wallace & Tiernan Company
Swim in Drinking Water.

Books

1) American Association of School Administrators
American School Buildings.

2) Babbitt and Doland - Water Supply Engineering

3) Earle B. Phelps - Public Health Engineering

4) Ehlers and Steel - Municipal and Rural Sanitation

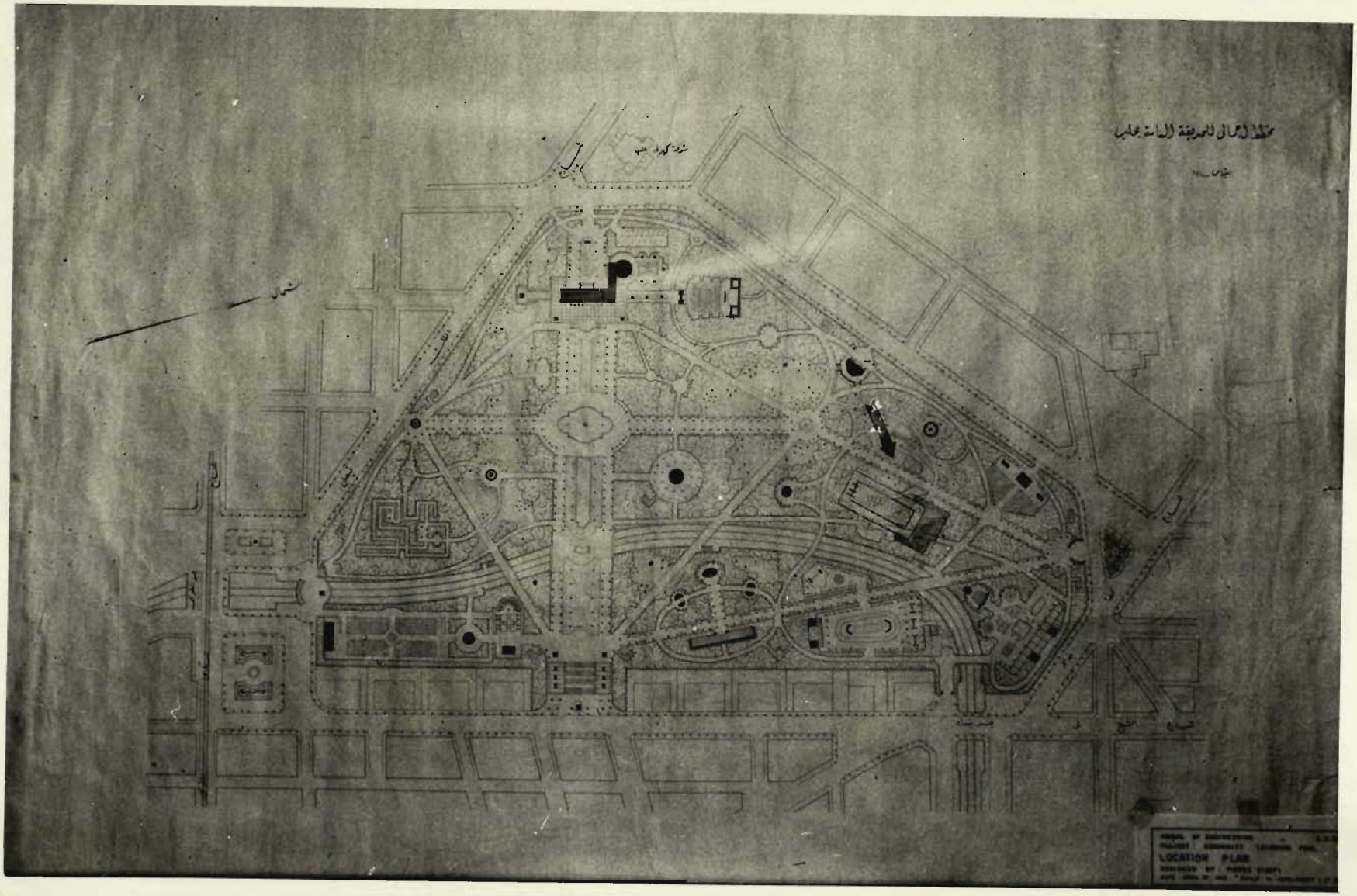
5) F. W. Dodge Corp. - Time Saver

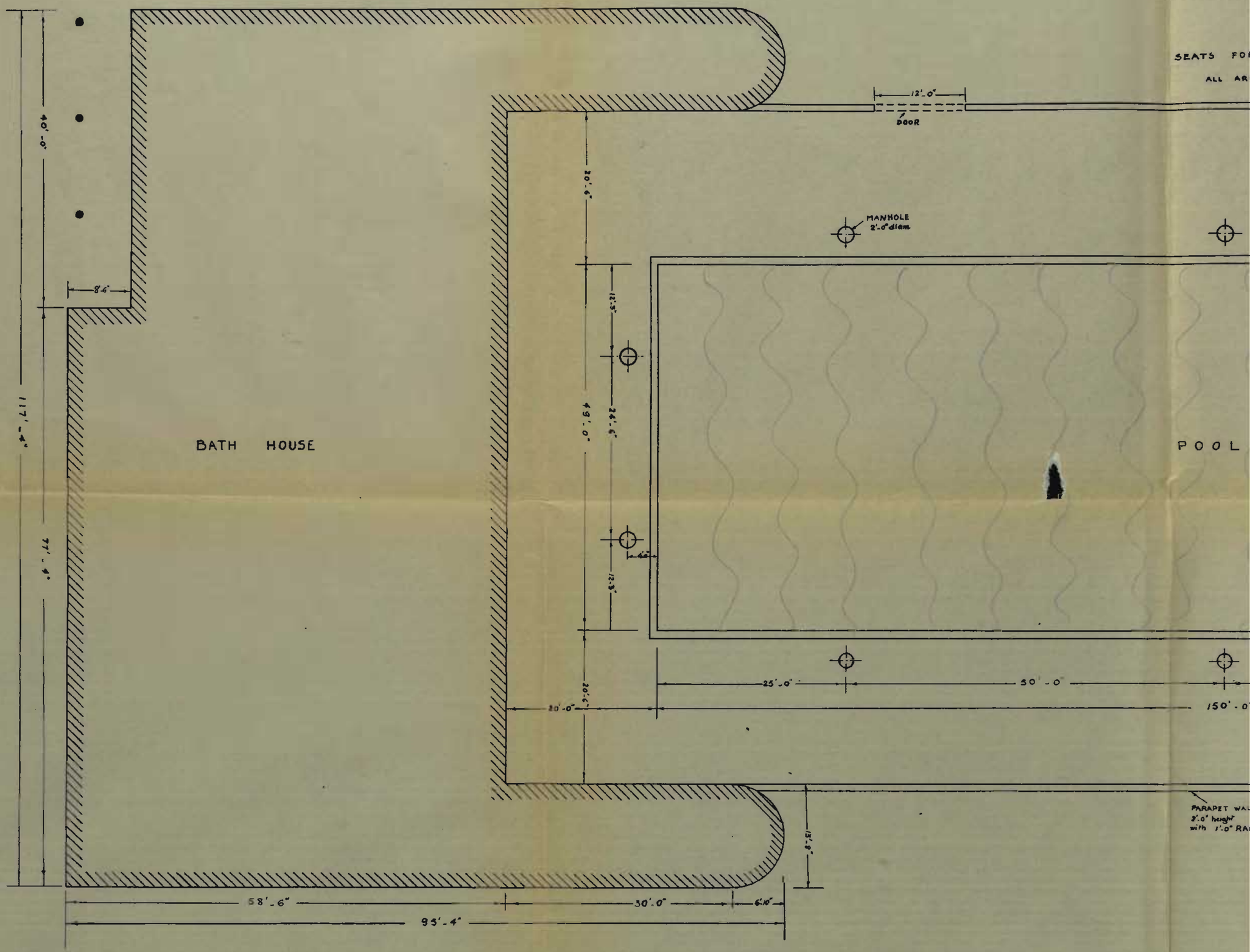
6) Harry Alexander Scott - Competitive Sports in Schools and Colleges

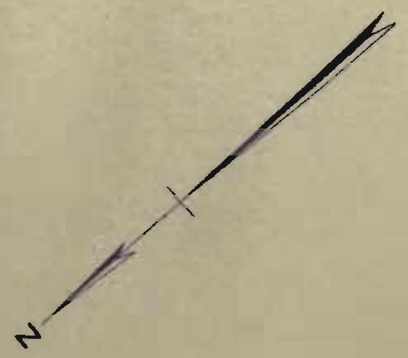
7) Illuminating Engineering Society- Handbook

8) Ramsey and Sleeper - Architectural Graphic Standards

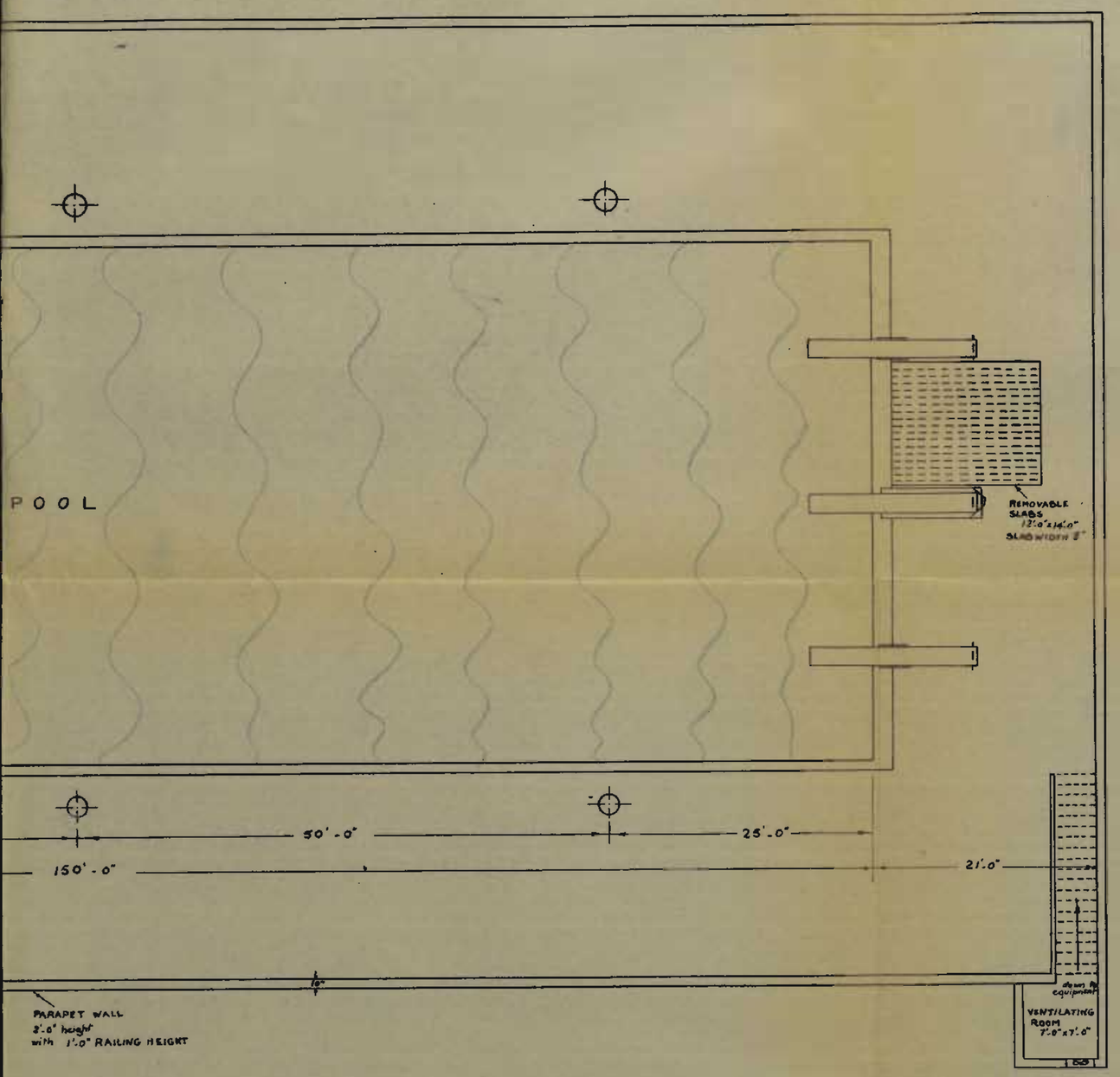
9) W. S. Gray - Reinforced Concrete Reservoirs and Tanks


مخطط الموقع العام للحديقة الملاصقة لمجلس
LOCATION PLAN

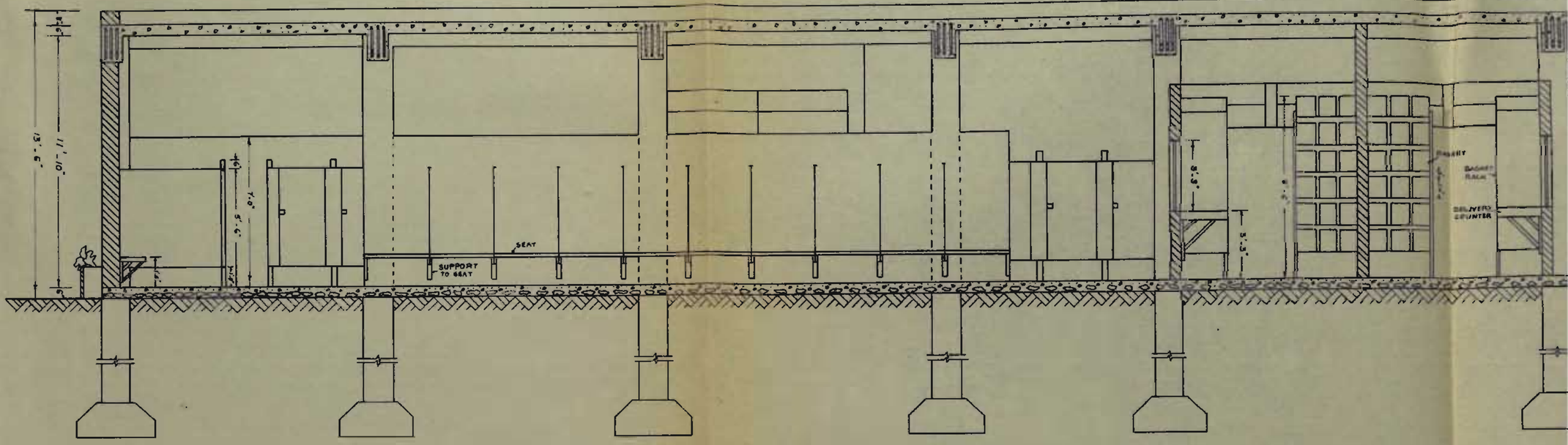

SEATS FO
ALL AR
12'-0"
DOOR
MANHOLE
2'-0" diam
40'-0"
8'-6"
117'-4"
77'-6"
20'-6"
12'-3"
49'-0"
24'-6"
4'-6"
12'-3"
BATH HOUSE
POOL
25'-0"
50'-0"
150'-0
30'-0"
20'-0"
PARAPET WA
3'-0" height
with 1'-0" RA
8'-12"
58'-6"
30'-0"
6'-10"
93'-4"



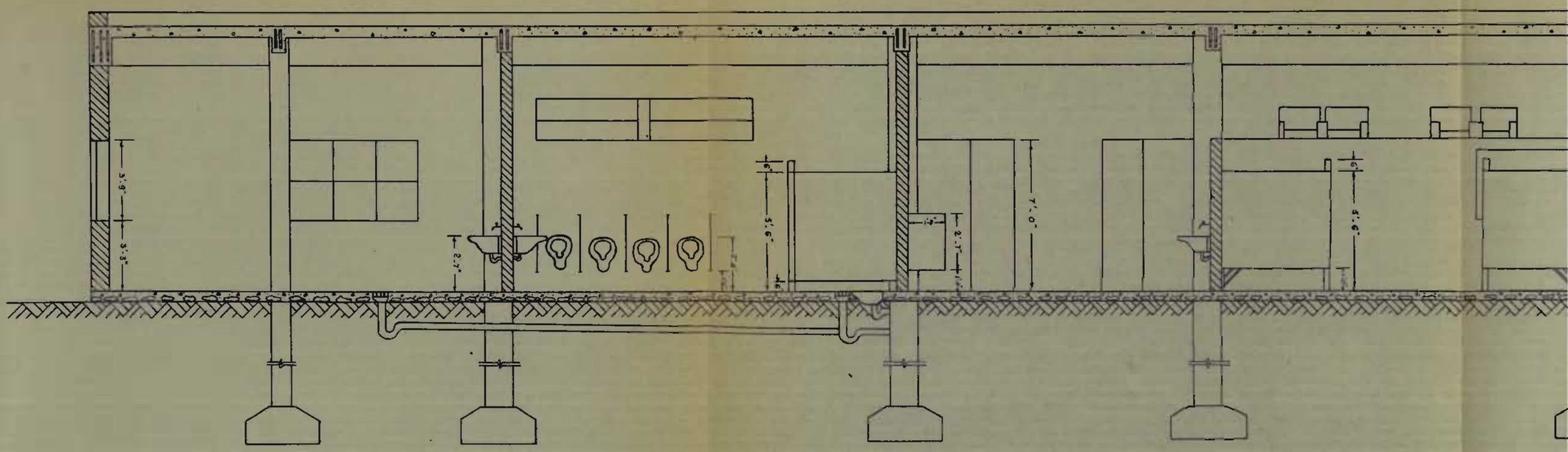
SEATS FOR PUBLIC
ALL AROUND



SCHOOL OF ENGINEERING – A.U.B.
PROJECT : COMMUNITY SWIMMING POOL
LAYOUT OF POOL AND BATH HOUSE
DESIGNED BY : PIERRE SIOUFI
DATE : APRIL 27, 1957 SCALE : 1m = 4'-0" SHEET 2 OF 15



SECTION A_A



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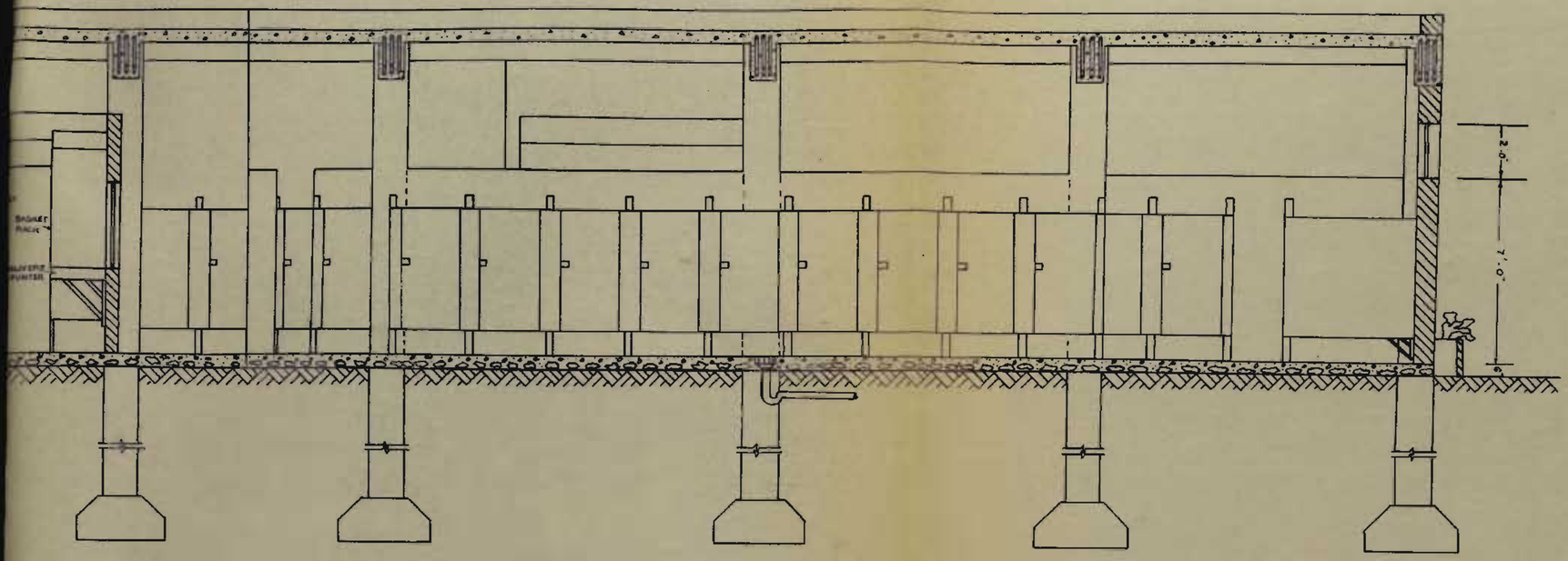

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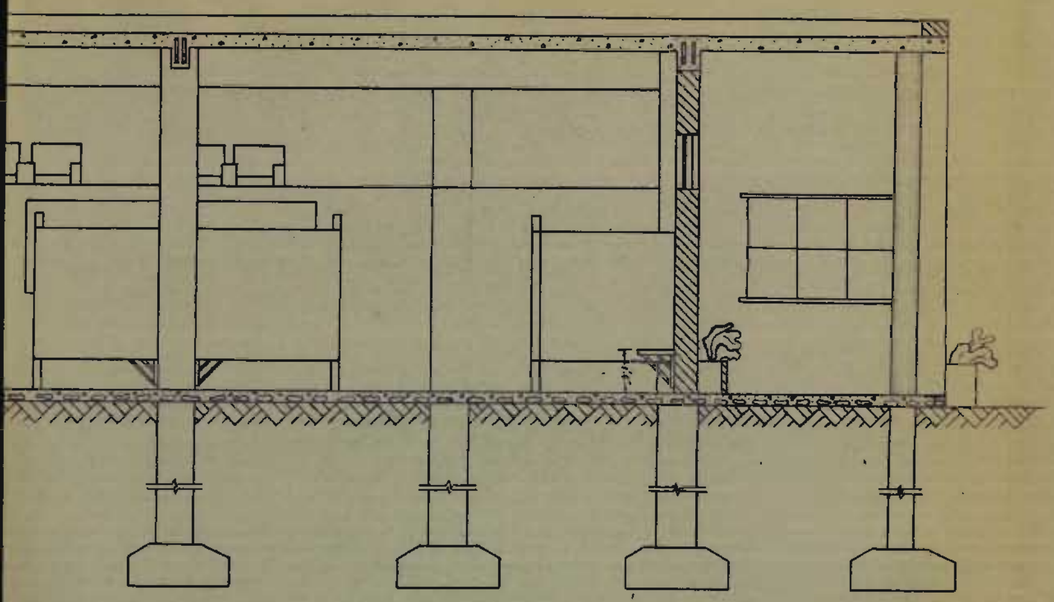


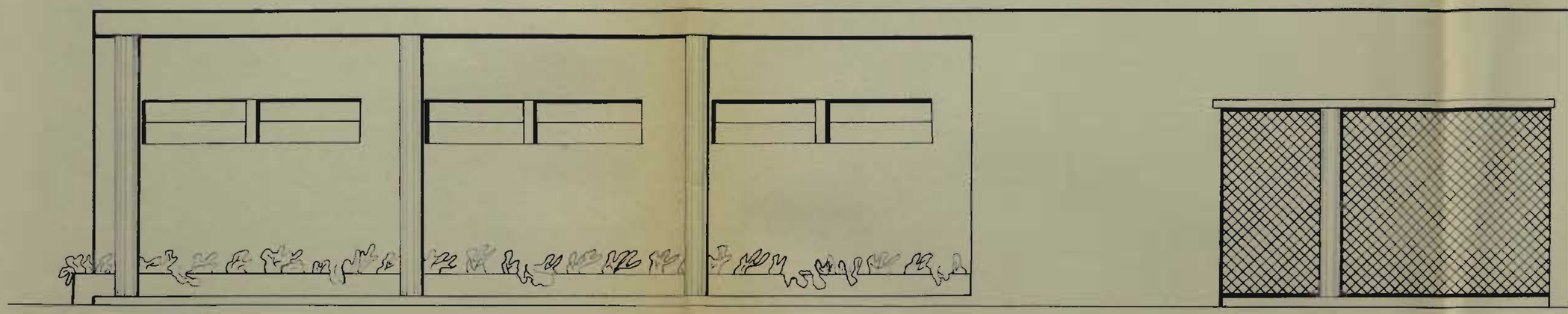
SCHOOL OF ENGINEERING - A.U.B.

PROJECT : COMMUNITY SWIMMING POOL

SECTIONS A_A AND B_B

DESIGNED BY : PIERRE SIOUFI

DATE : APRIL 27 1953 SCALE : 0.6cm = 1.0' SHEET 4 OF 13



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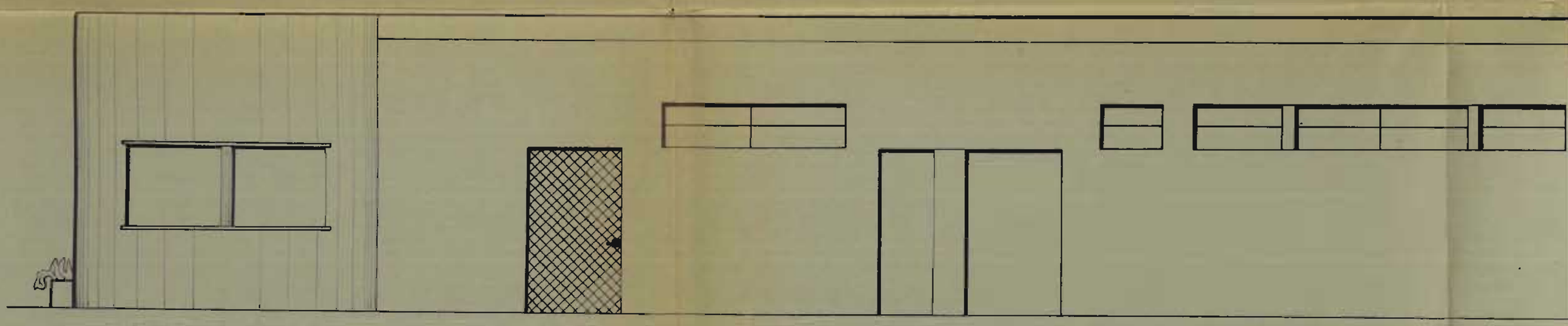

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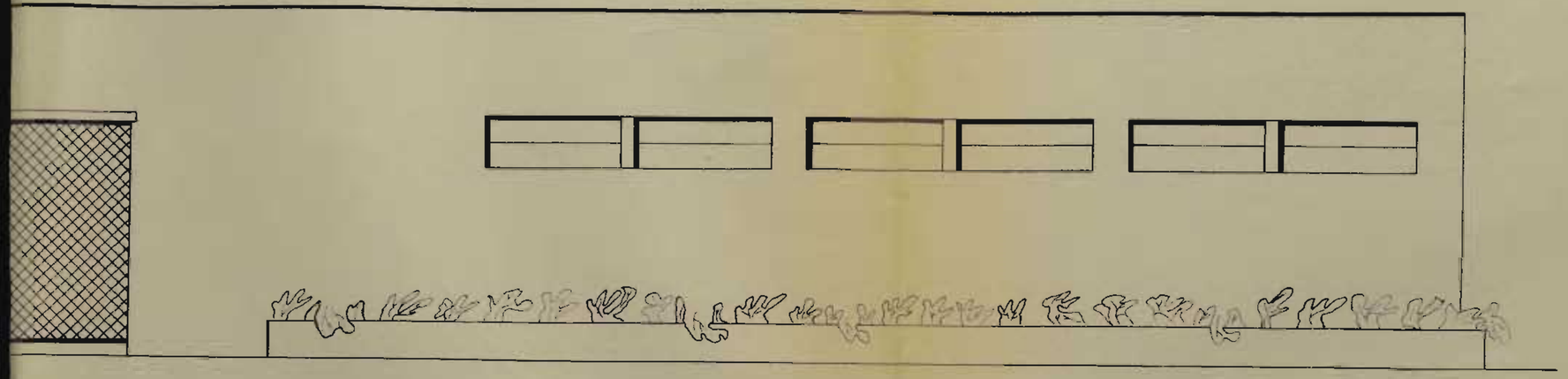

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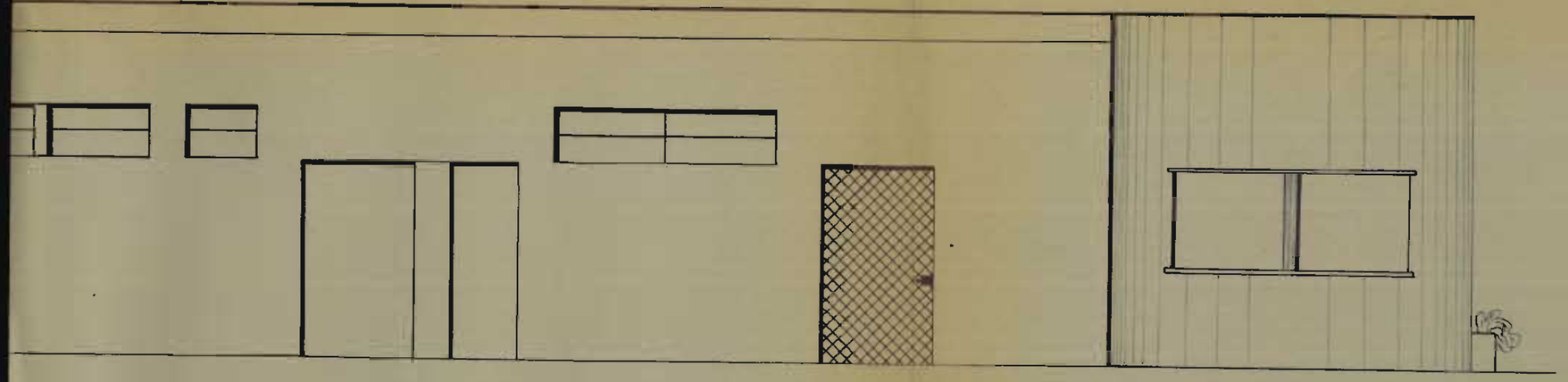

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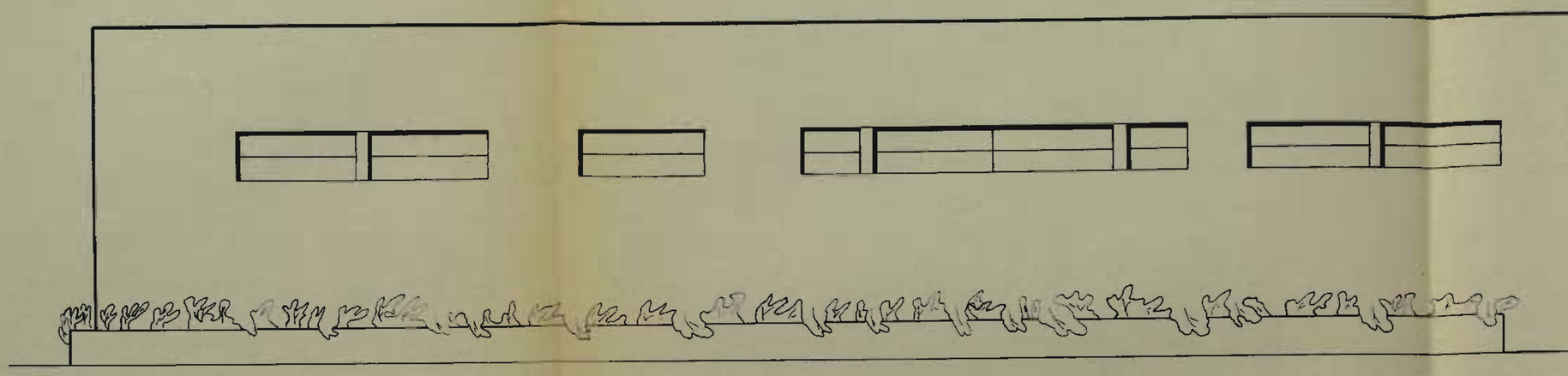
SCHOOL OF ENGINEERING - A.U.B.

PROJECT COMMUNITY SWIMMING POOL

ELEVATIONS

DESIGNED BY PIERRE SIOUFI

DATE: APRIL 27, 1953 SCALE 0.8cm = 1'-0" SHEET 5 OF 15



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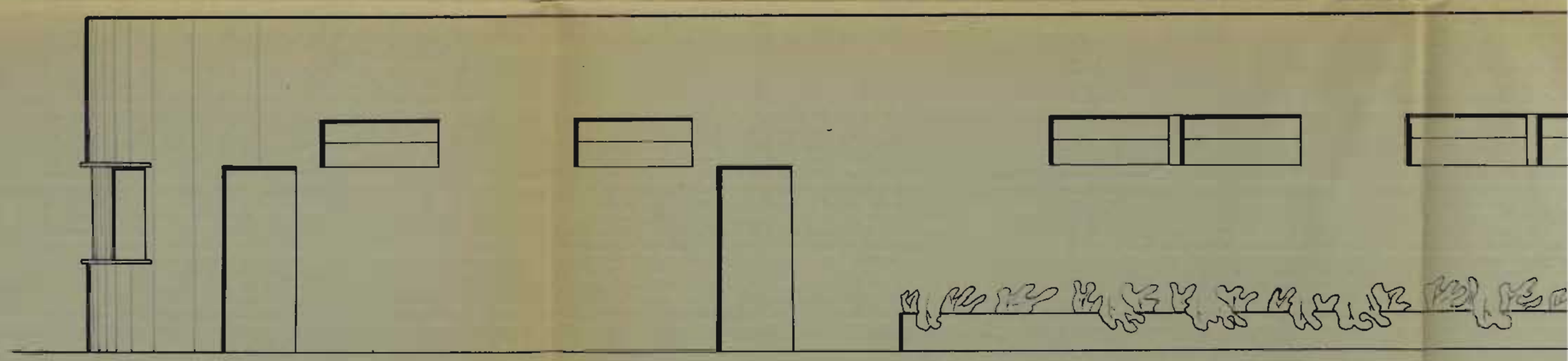

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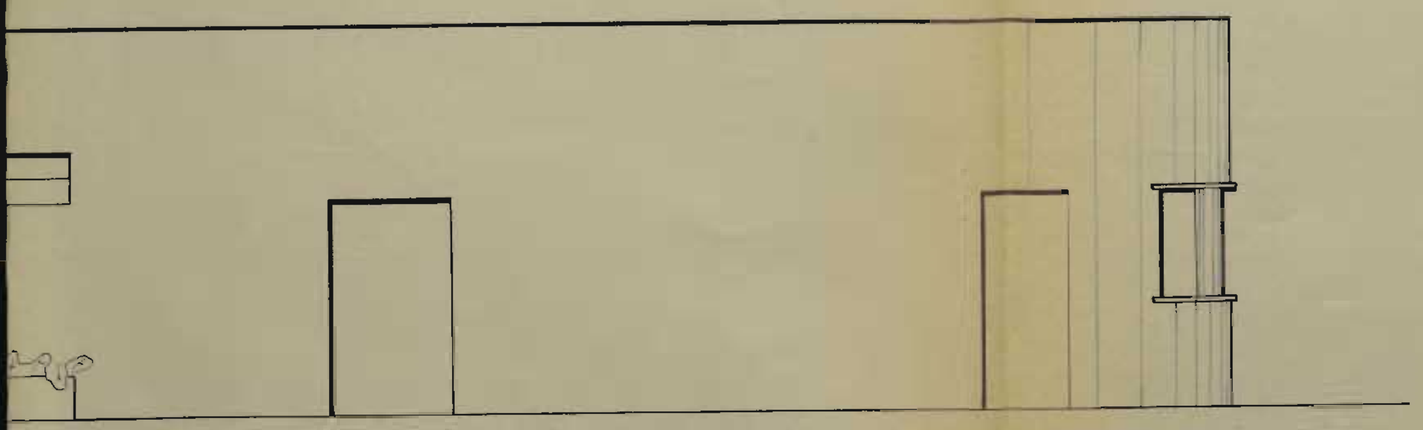
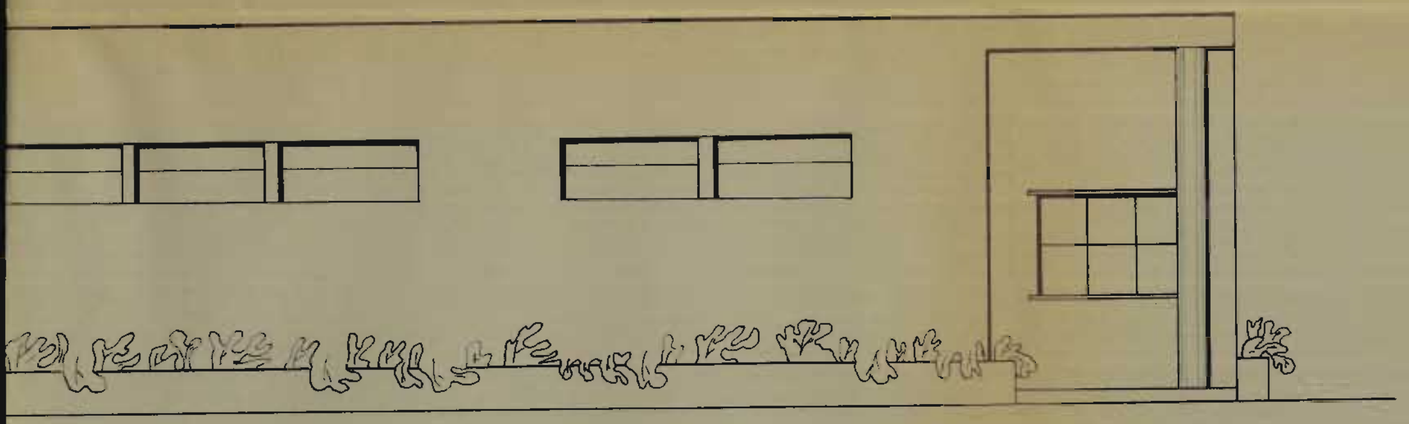




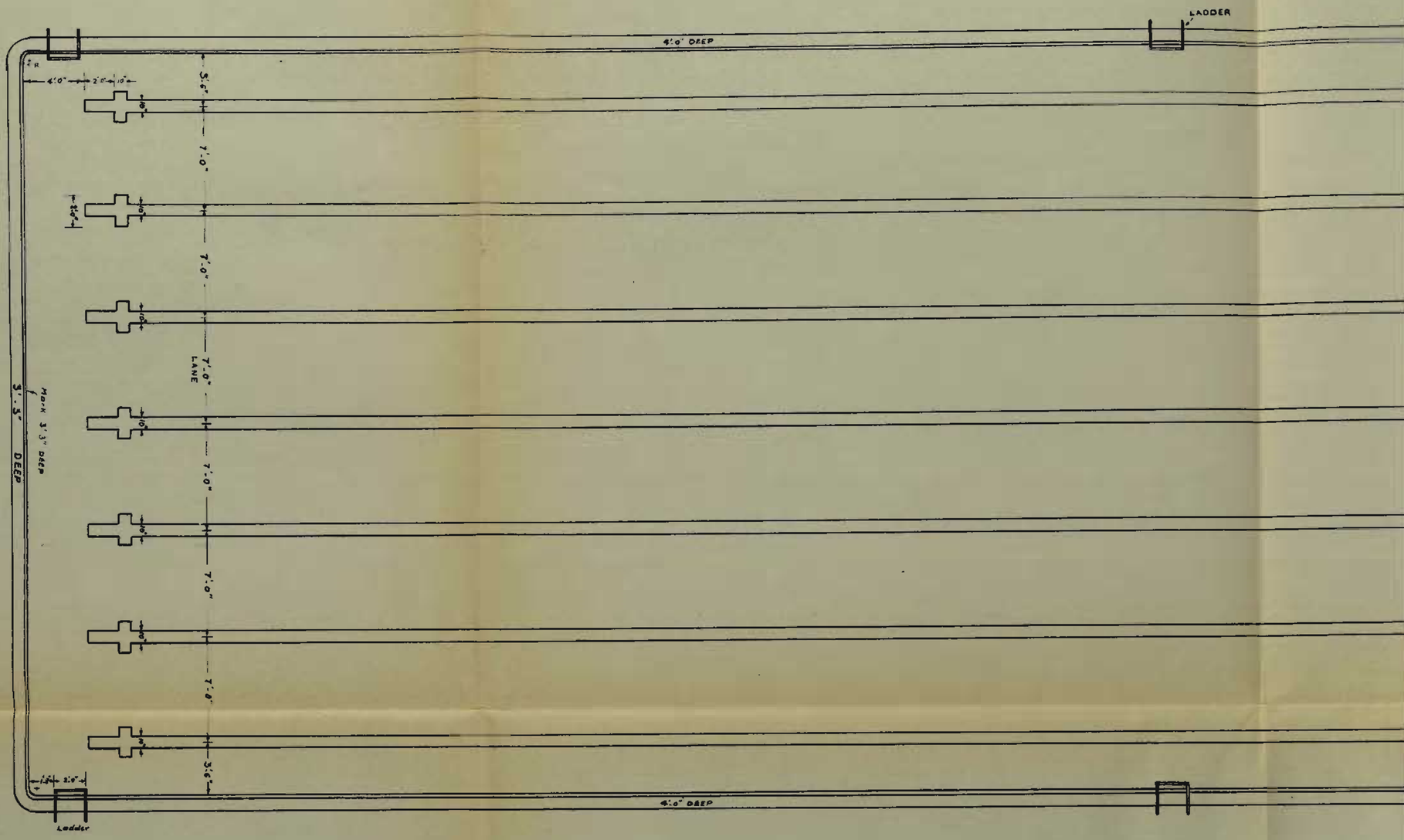
SCHOOL OF ENGINEERING — A.U.B.

PROJECT : COMMUNITY SWIMMING POOL

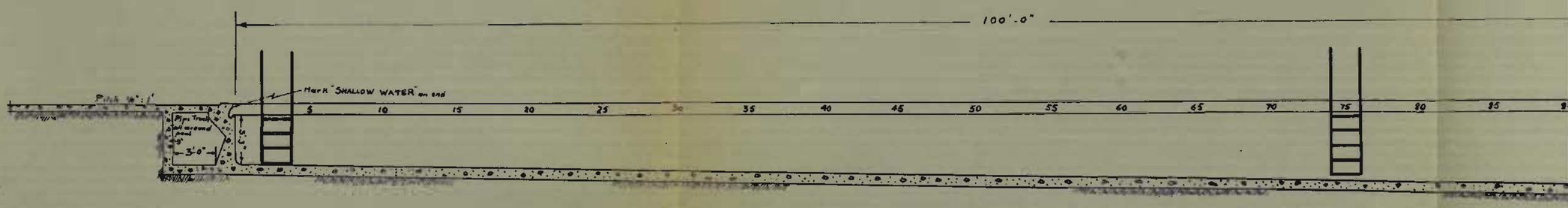
ELEVATIONS

DESIGNED BY : PIERRE SIOUFI

DATE : APRIL 27 , 1953 SCALE : 1/8" = 1'-0" SHEET 8 OF 13



PLAN



LONGITUDINAL SECTION

N

5'-0" DEEP 6'-0" DEEP 7'-0" DEEP 8'-0" DEEP 9'-0" DEEP 10'-0" DEEP 11'-0" DEEP 12'-0" DEEP 11'-0" DEEP

6'-0" 10'-0"

0'-0" 14'-6" 14'-0" 49'-0"

Plan

5'-0" DEEP 6'-0" DEEP 7'-0" DEEP 8'-0" DEEP 9'-0" DEEP 10'-0" DEEP 11'-0" DEEP 12'-0" DEEP 11'-0" DEEP

40'-0" 10'-0"

85 90 95 100 105 110 115 120 125 130 135 140 145

Mark Deep Water

Beam

5'-0" 6'-6" 5'-0" 11'-3"

ON

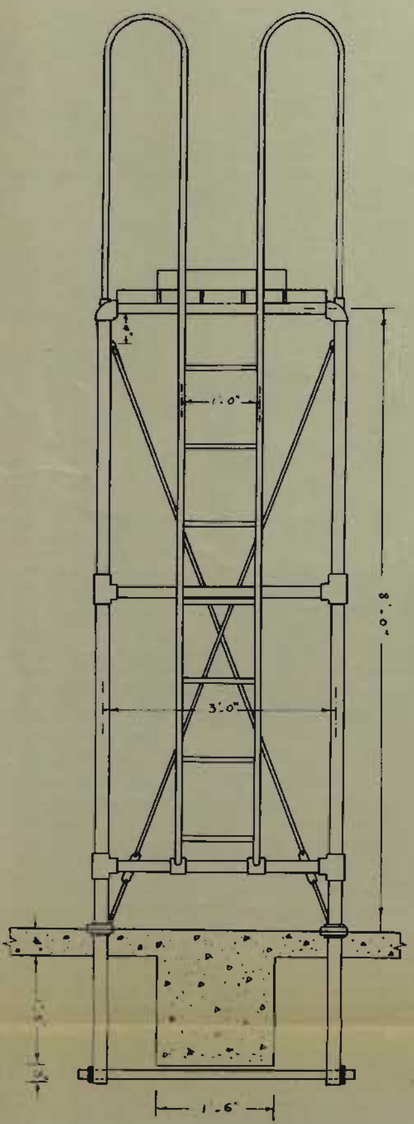
SCHOOL OF ENGINEERING — A.U.B

PROJECT : COMMUNITY SWIMMING POOL

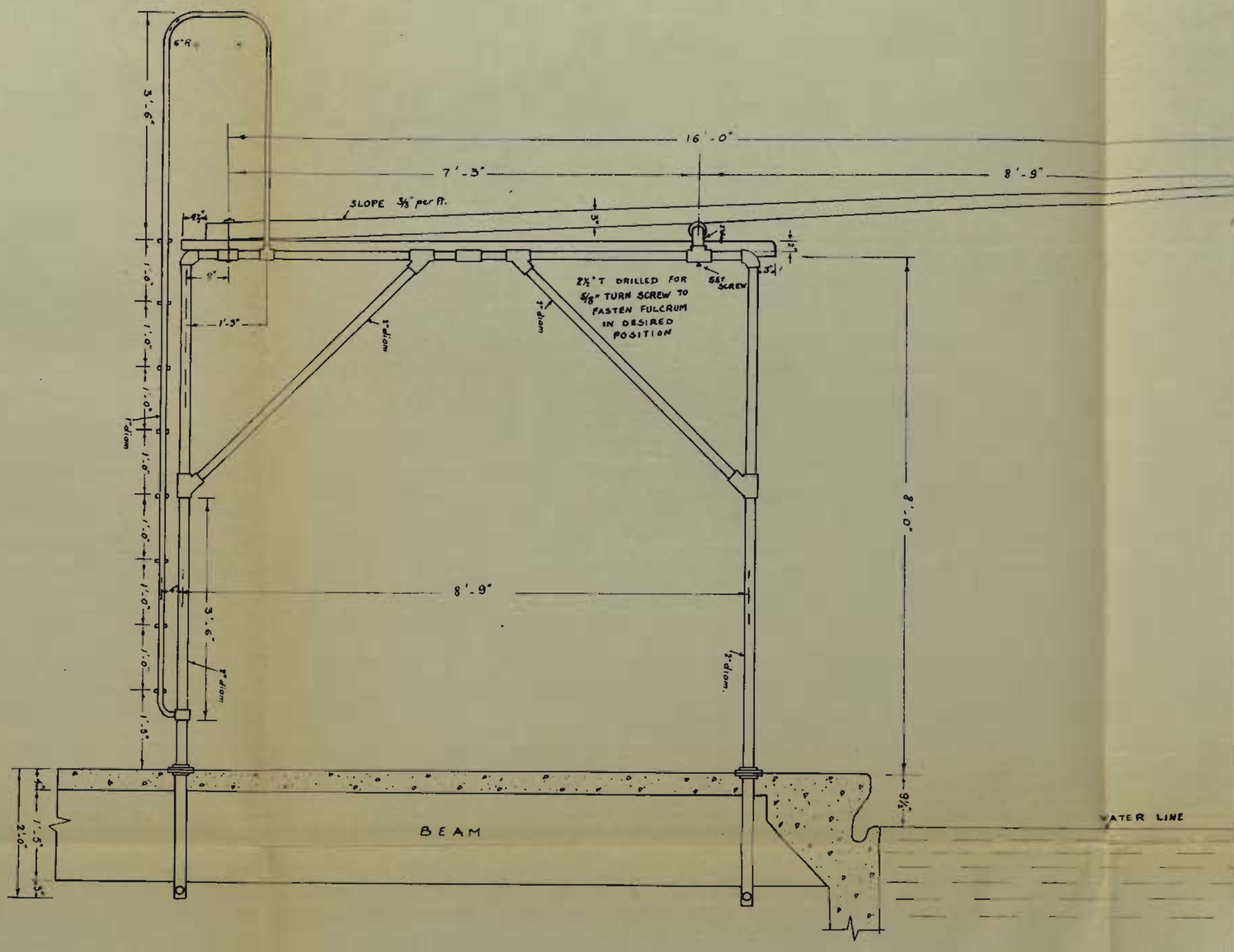
PLAN AND SECTION OF POOL

DESIGNED BY PIERRE SIOUFI

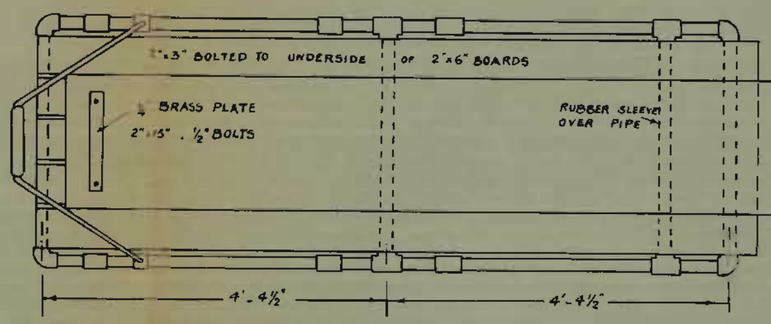
DATE APRIL 27, 1955 SCALE 1/4"=1'-0" SHEET 7 OF 15



REAR OF STAND



SIDE ELEVATION



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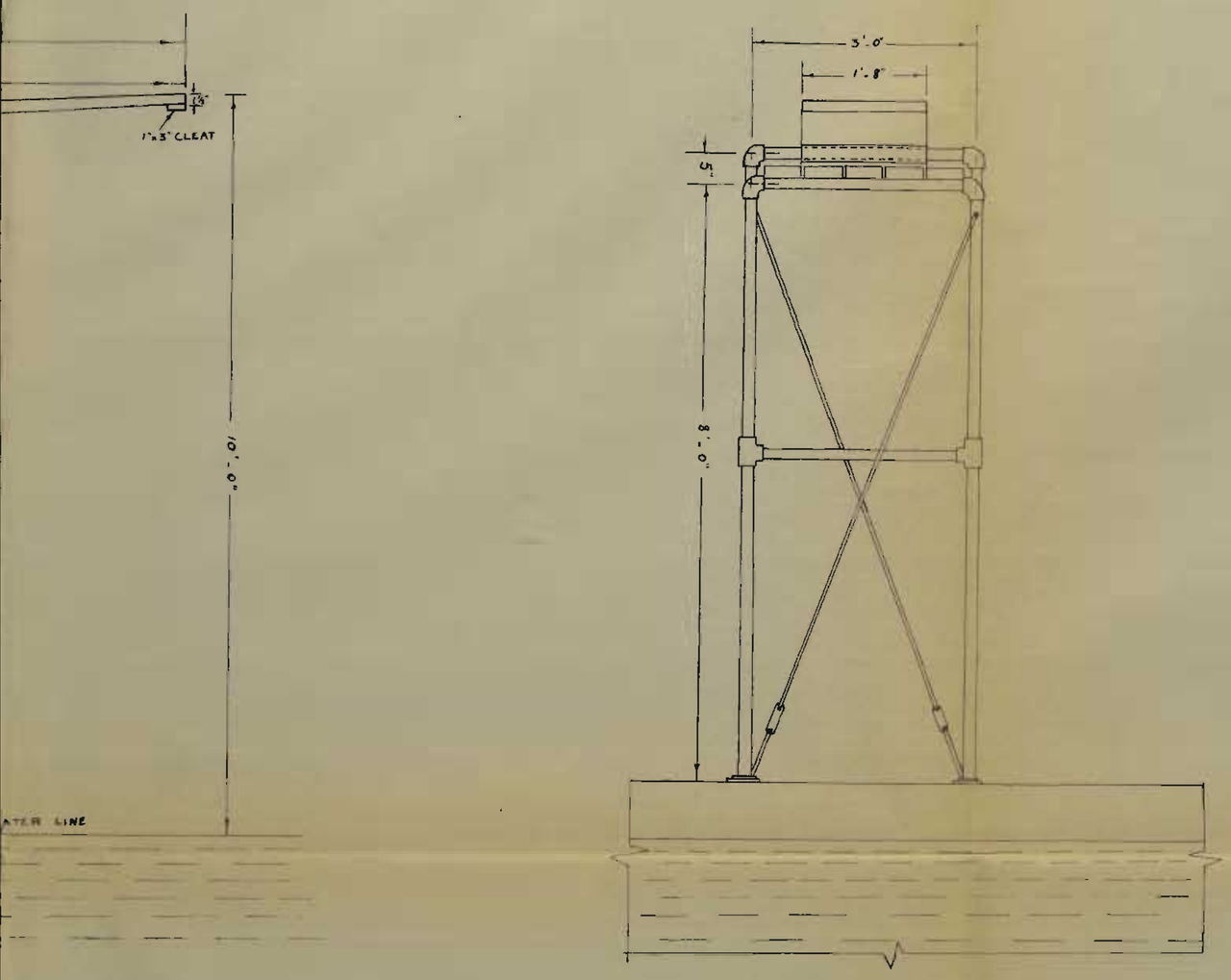
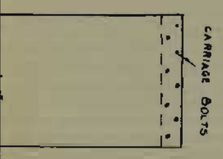


FRONT OF STAND



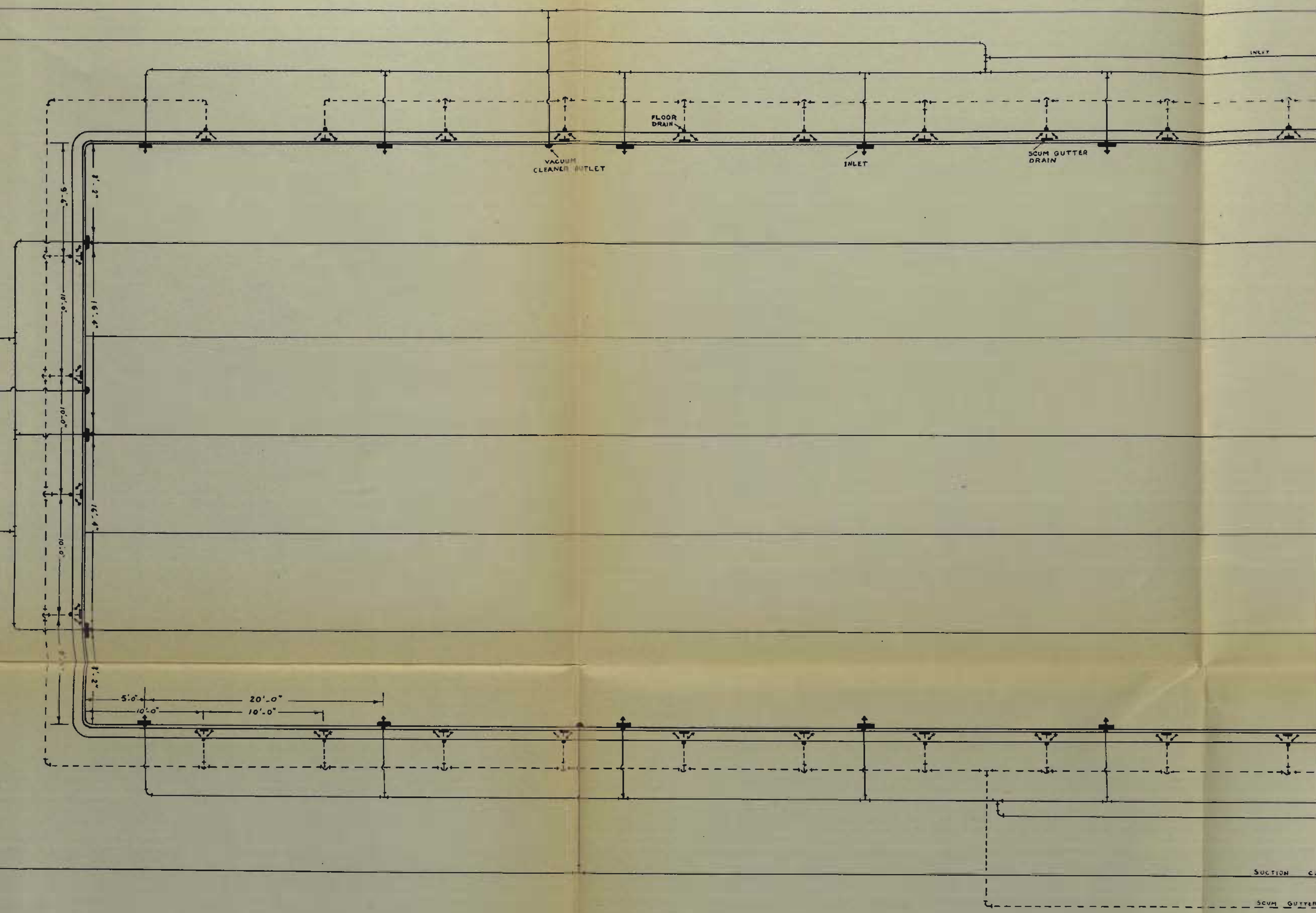
SCHOOL OF ENGINEERING — A U B

PROJECT. COMMUNITY SWIMMING POOL

SPRING BOARD (10'-0")

DESIGNED BY : PIERRE SIOUFI

DATE APRIL 27 1953 SCALE 1/4"=1'-0" SHEET 8 OF 15



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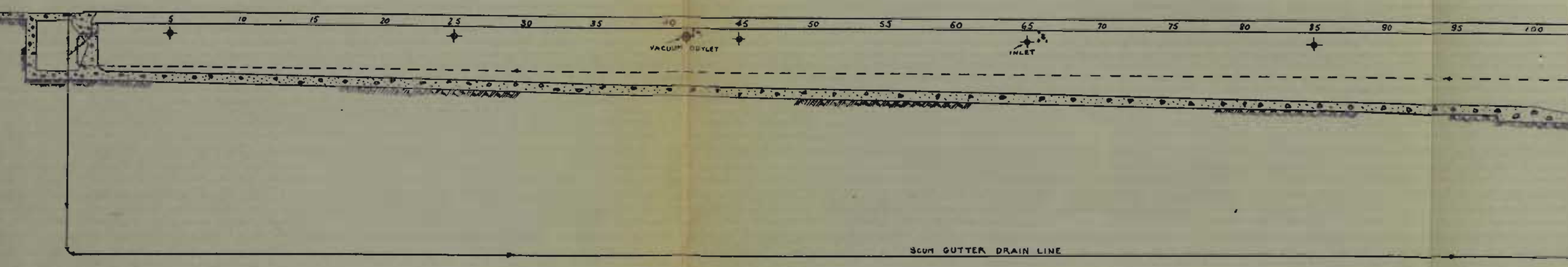
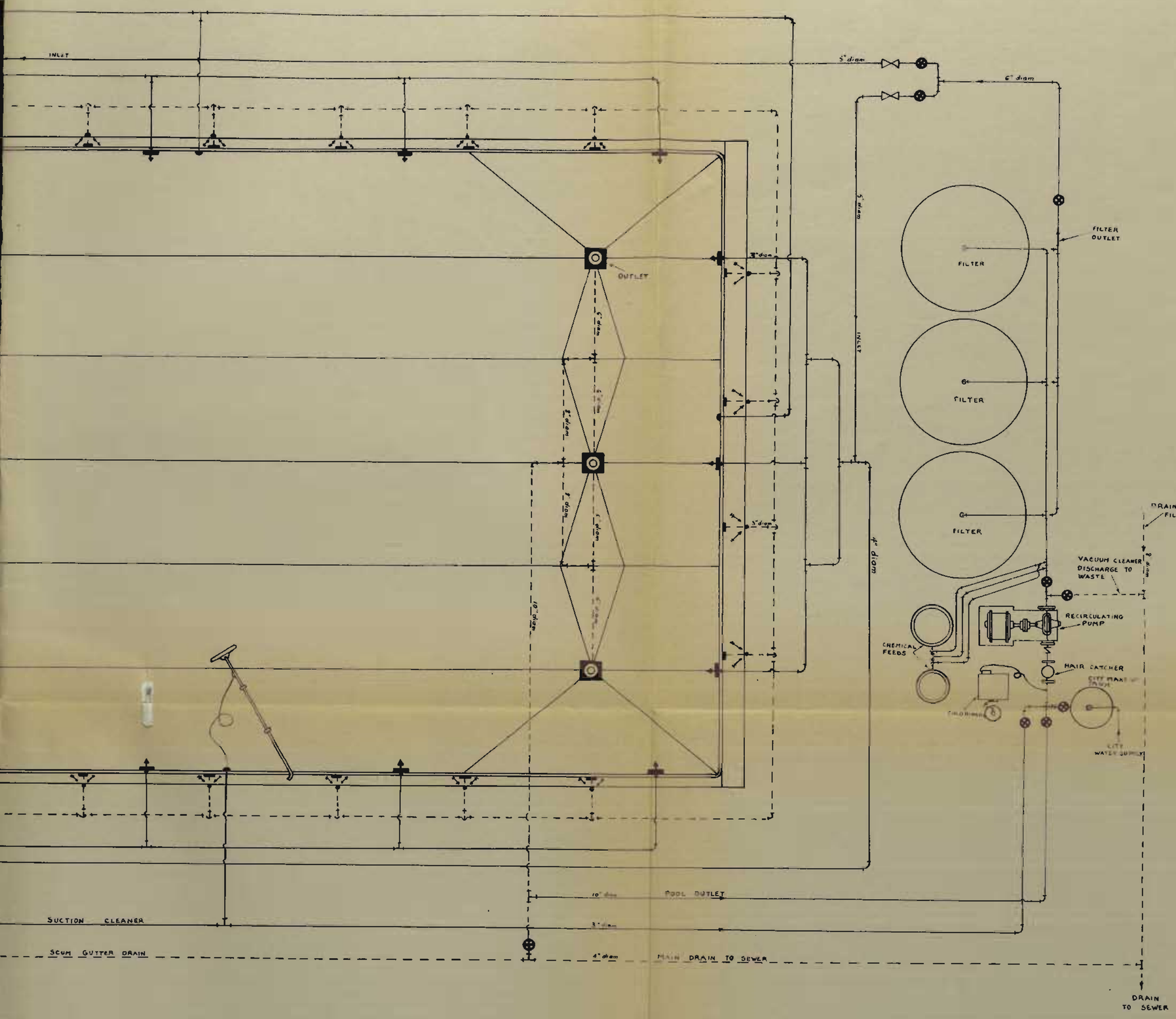


SECTION

SCHOOL OF ENGINEERING - A.U.B. PROJECT: COMMUNITY SWIMMING POOL — PLUMBING OF POOL



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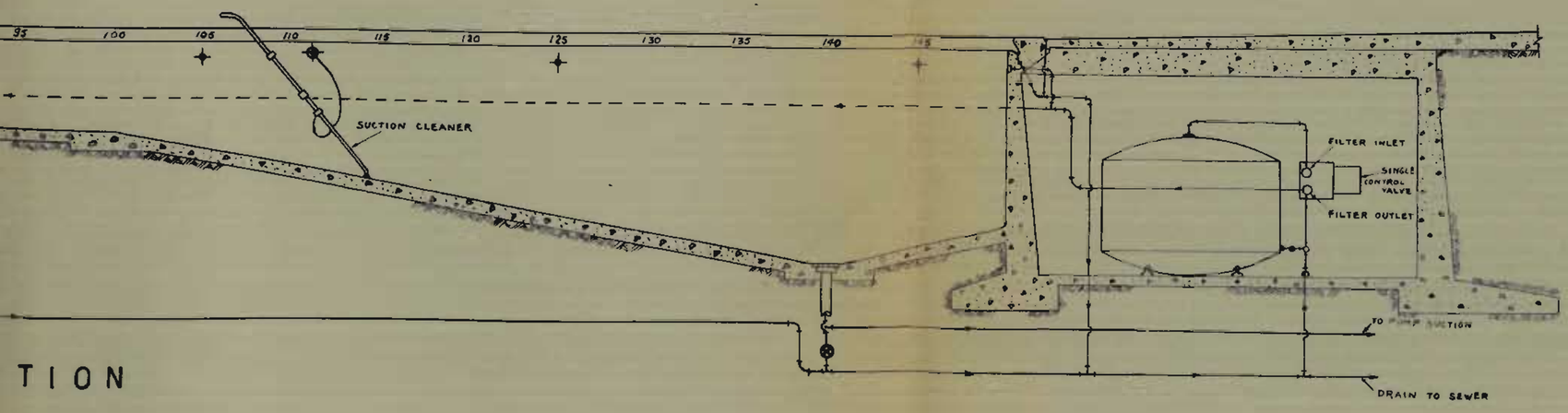
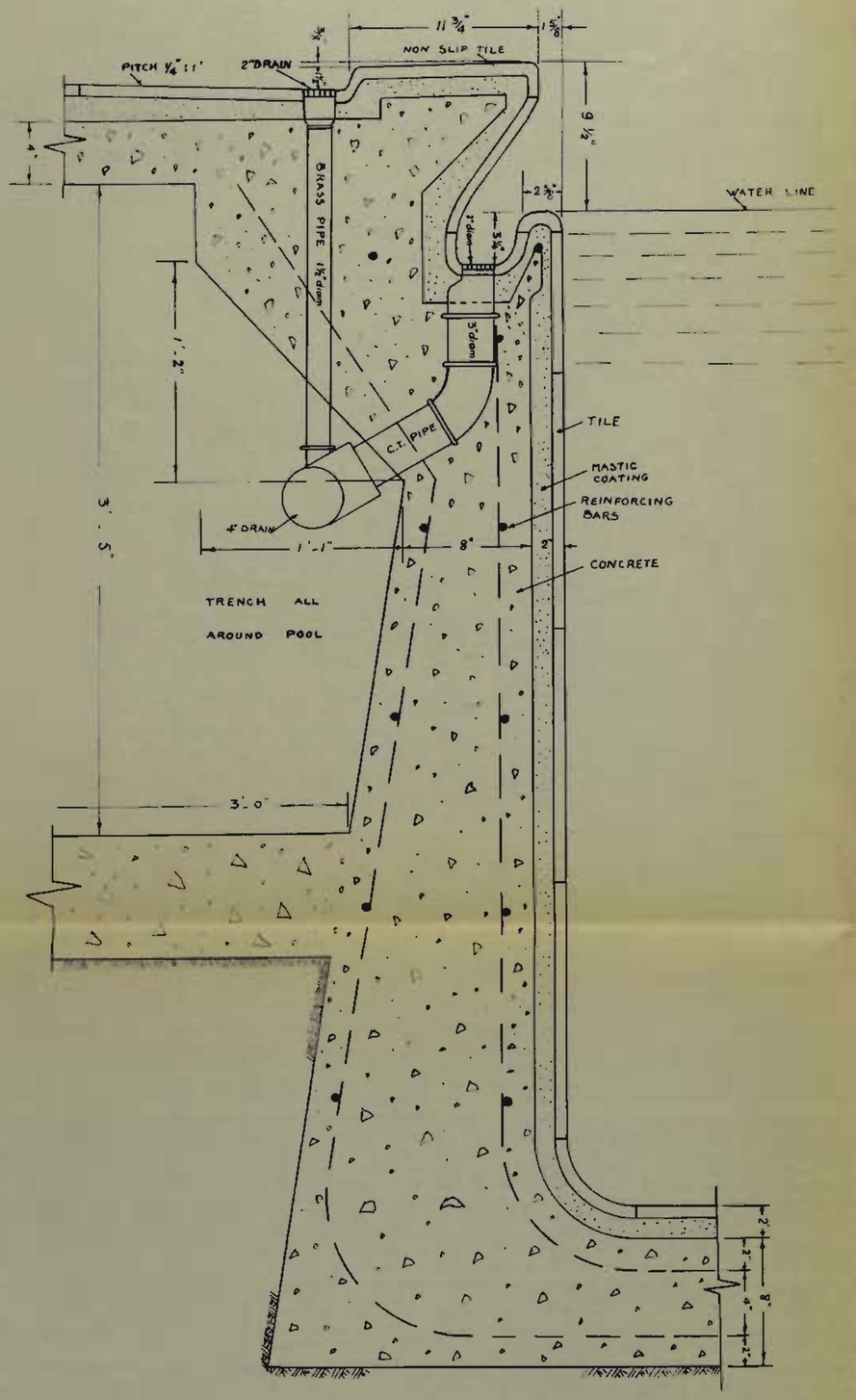


TION

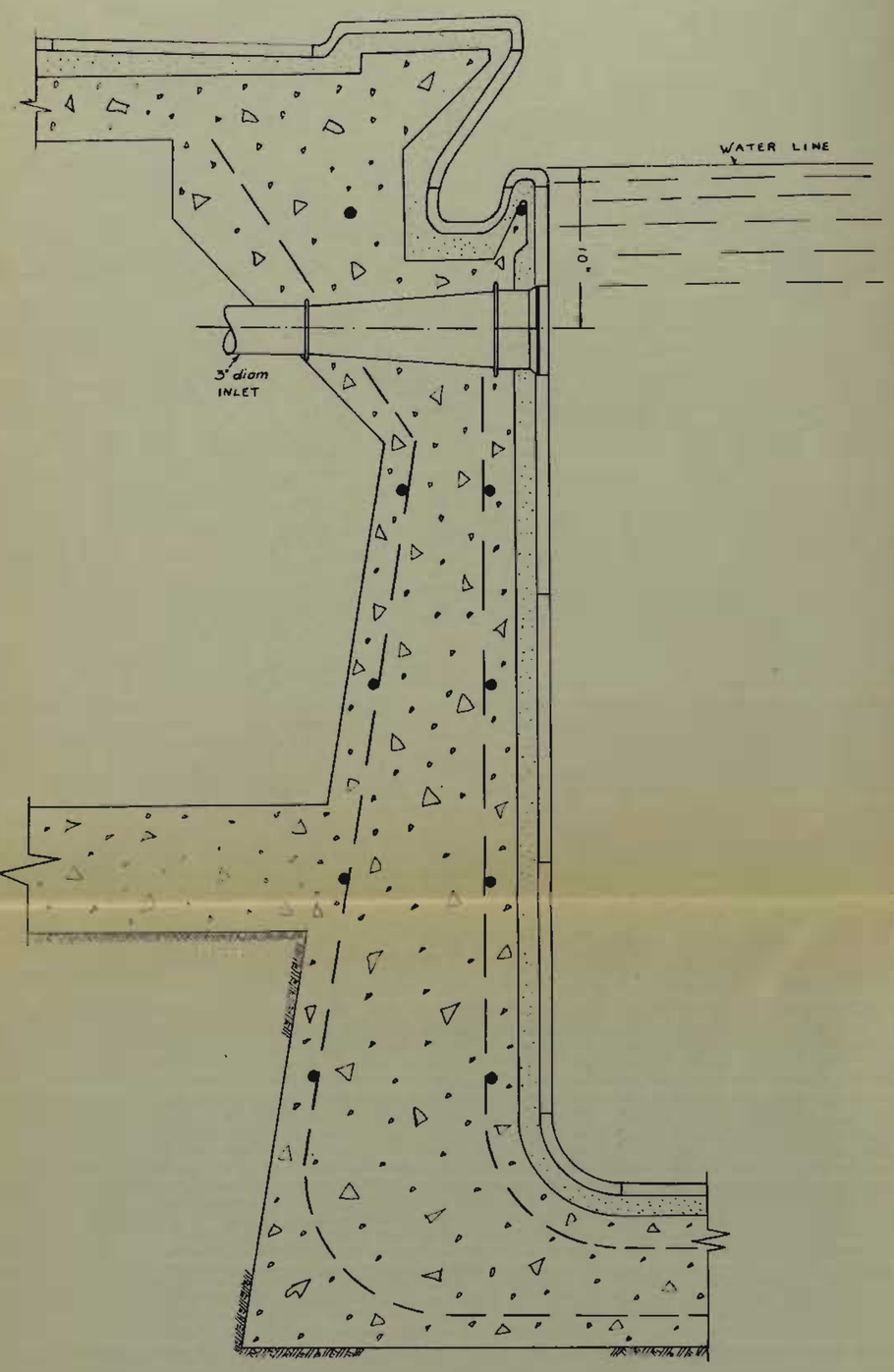
OF POOL

DESIGNED BY: PIERRE SIOUFI

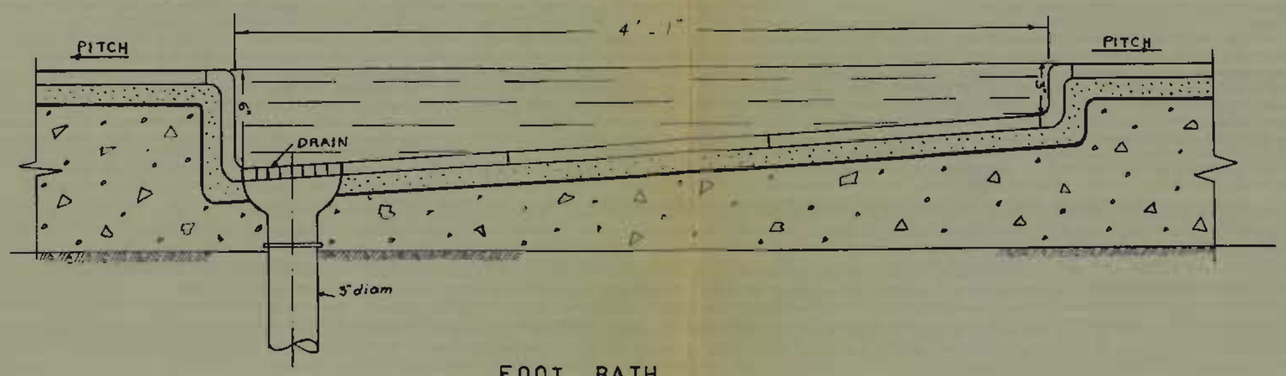
DATE APRIL 27, 1955



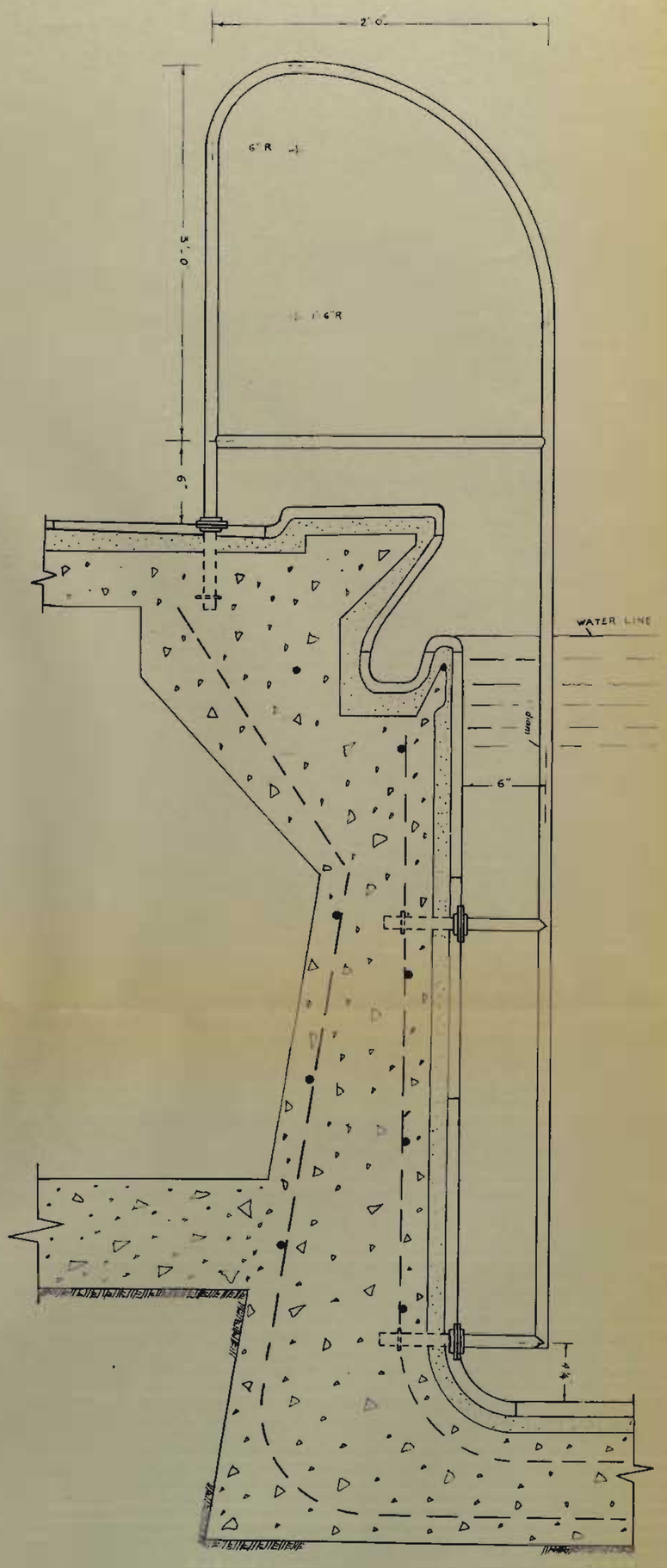
SECTION THROUGH SCUM GUTTER DRAIN



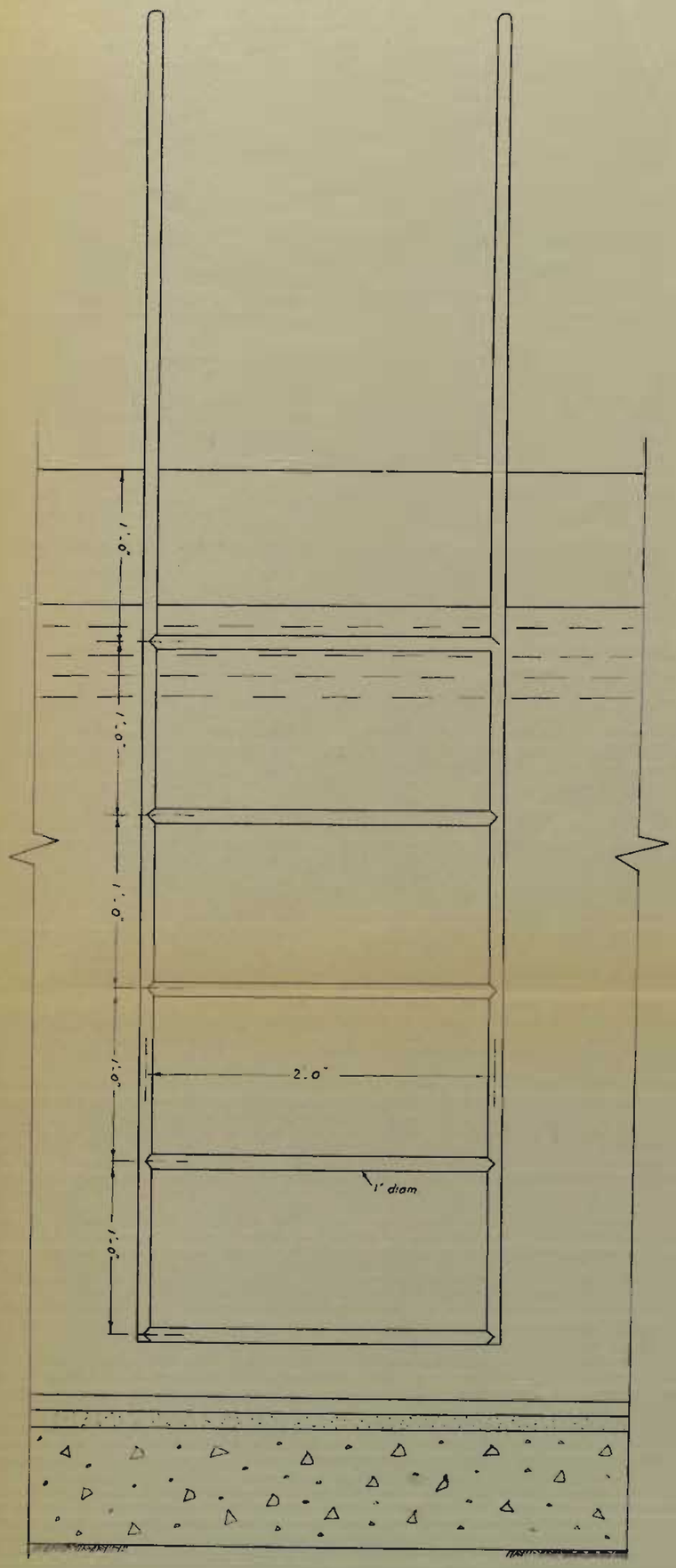
SECTION THROUGH INLET



FOOT BATH

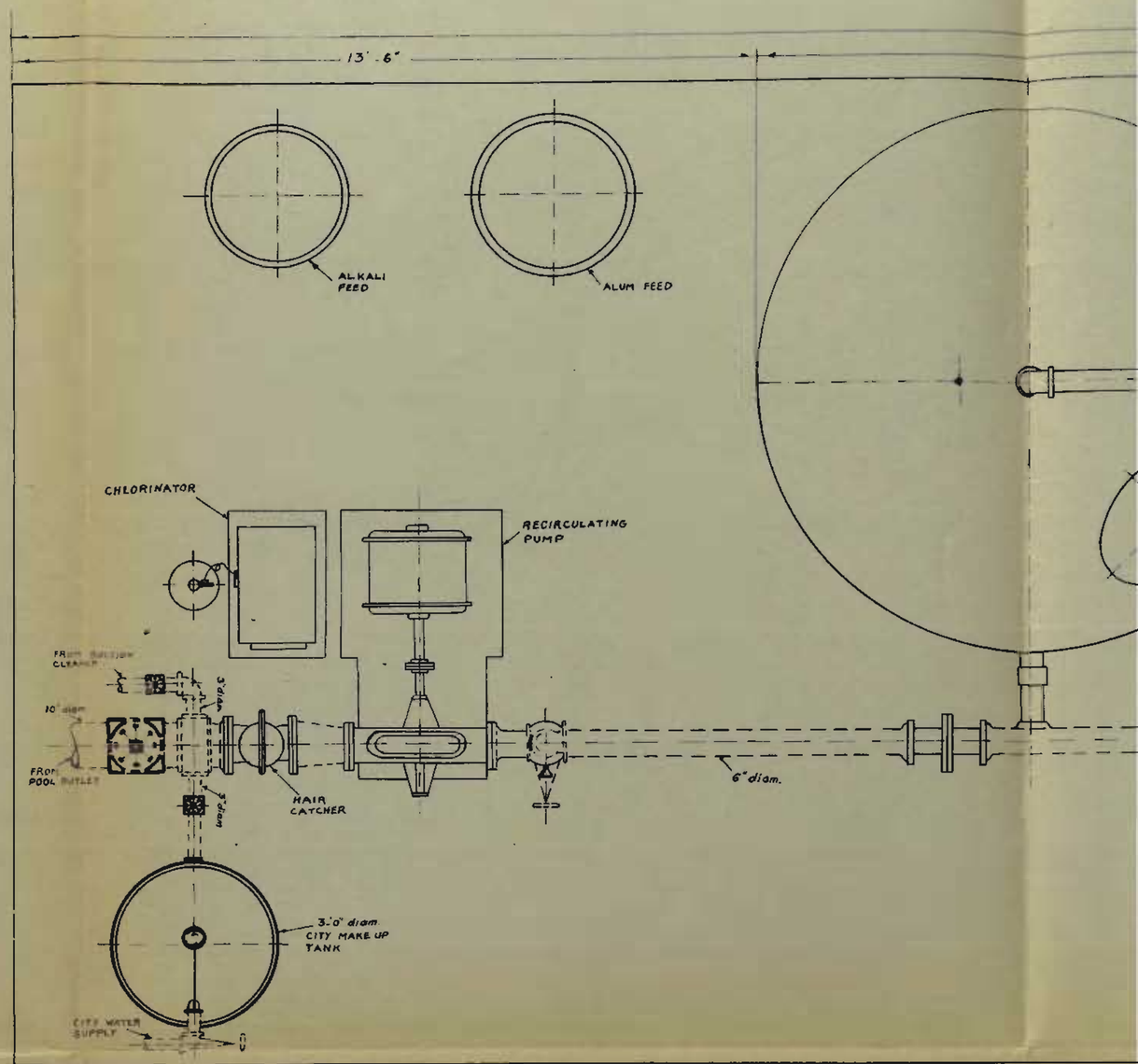


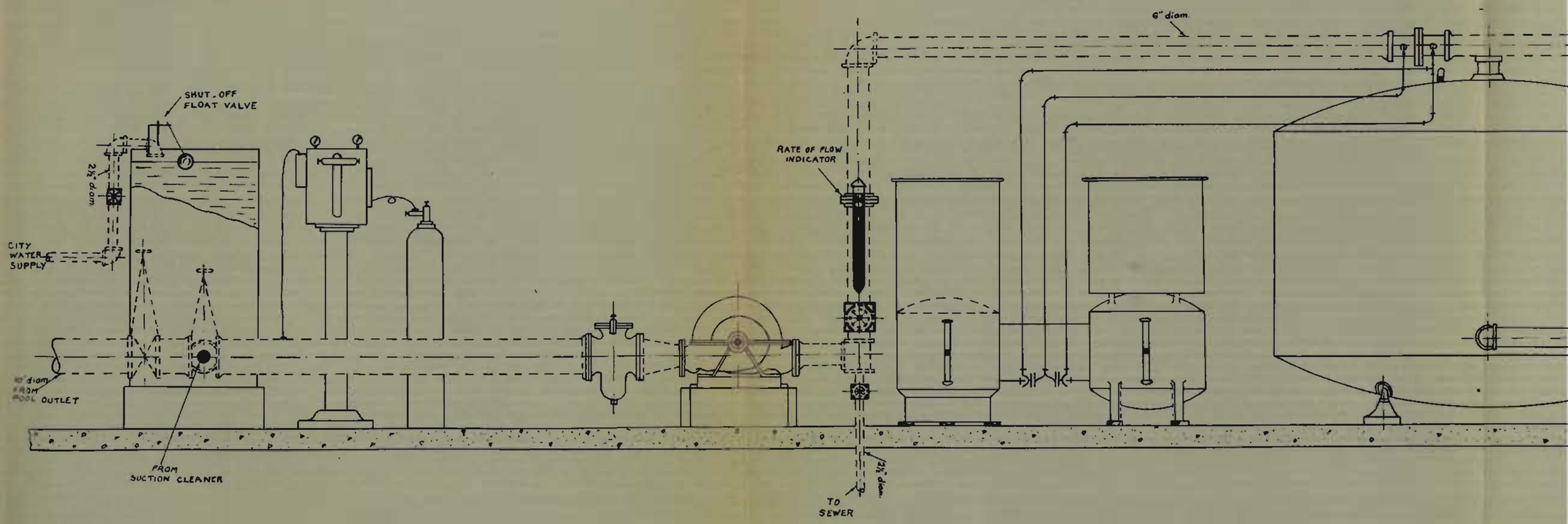
SECTION THROUGH LADDER



ELEVATION OF LADDER

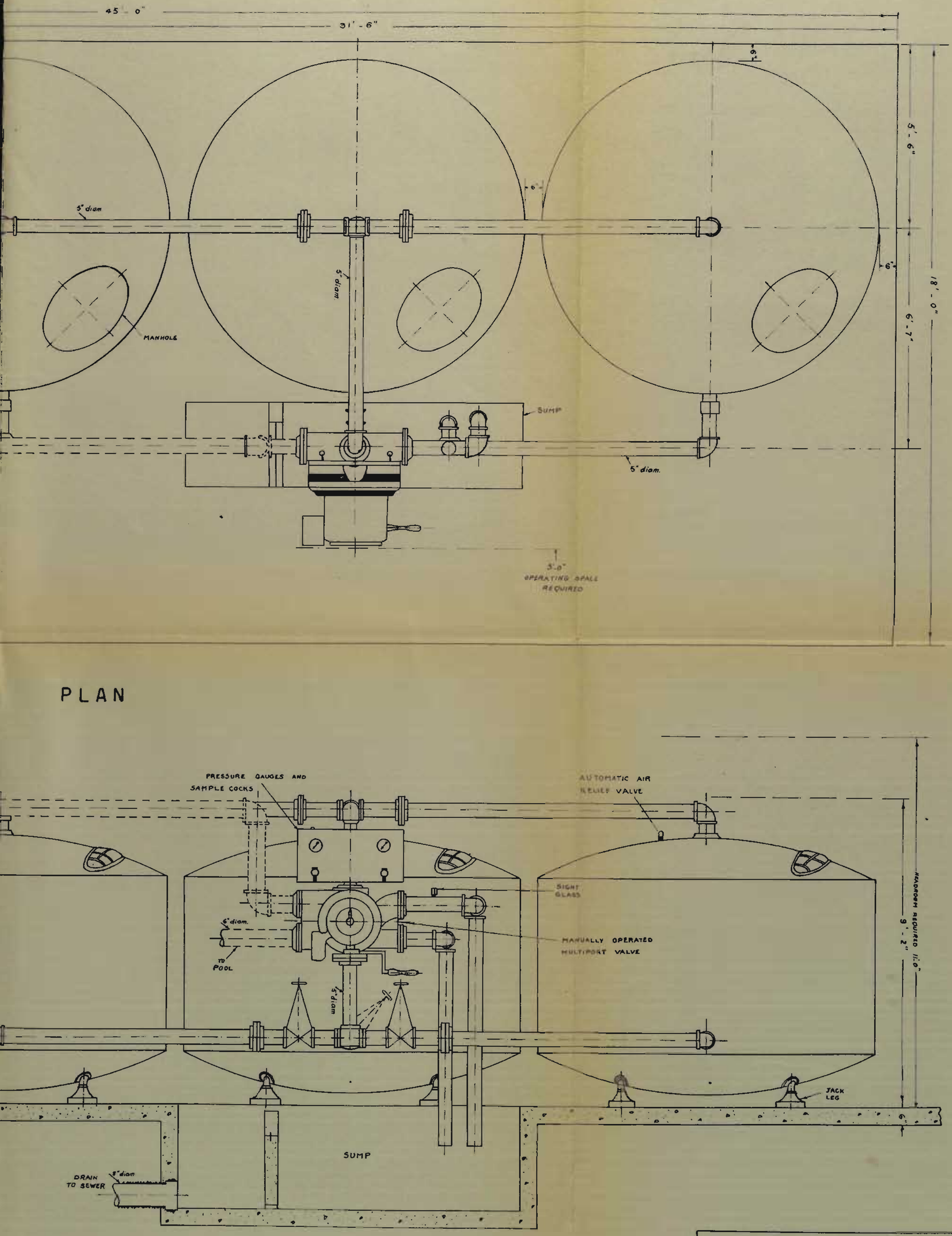
SCHOOL OF ENGINEERING - A U B
PROJECT: COMMUNITY SWIMMING POOL
TYPICAL TILE POOL SECTIONS
DESIGNED BY: PIERRE SIOUFI
DATE: APRIL 27 1953 SCALE: 1" = 1'-0" SHEET 1 OF 1


13'-6"
ALKALI FEED
ALUM FEED
CHLORINATOR
RECIRCULATING PUMP
FROM SUCTION CLEANER
10" diam
FROM POOL OUTLET
3" diam
HAIR CATCHER
6" diam.
3'-0" diam
CITY MAKE UP TANK
CITY WATER SUPPLY


SHUT-OFF FLOAT VALVE
2½" diam
CITY WATER SUPPLY
10" diam FROM POOL OUTLET
FROM SUCTION CLEANER
RATE OF FLOW INDICATOR
6" diam.
2½" diam
TO SEWER

ELEVATION

PLAN



ON

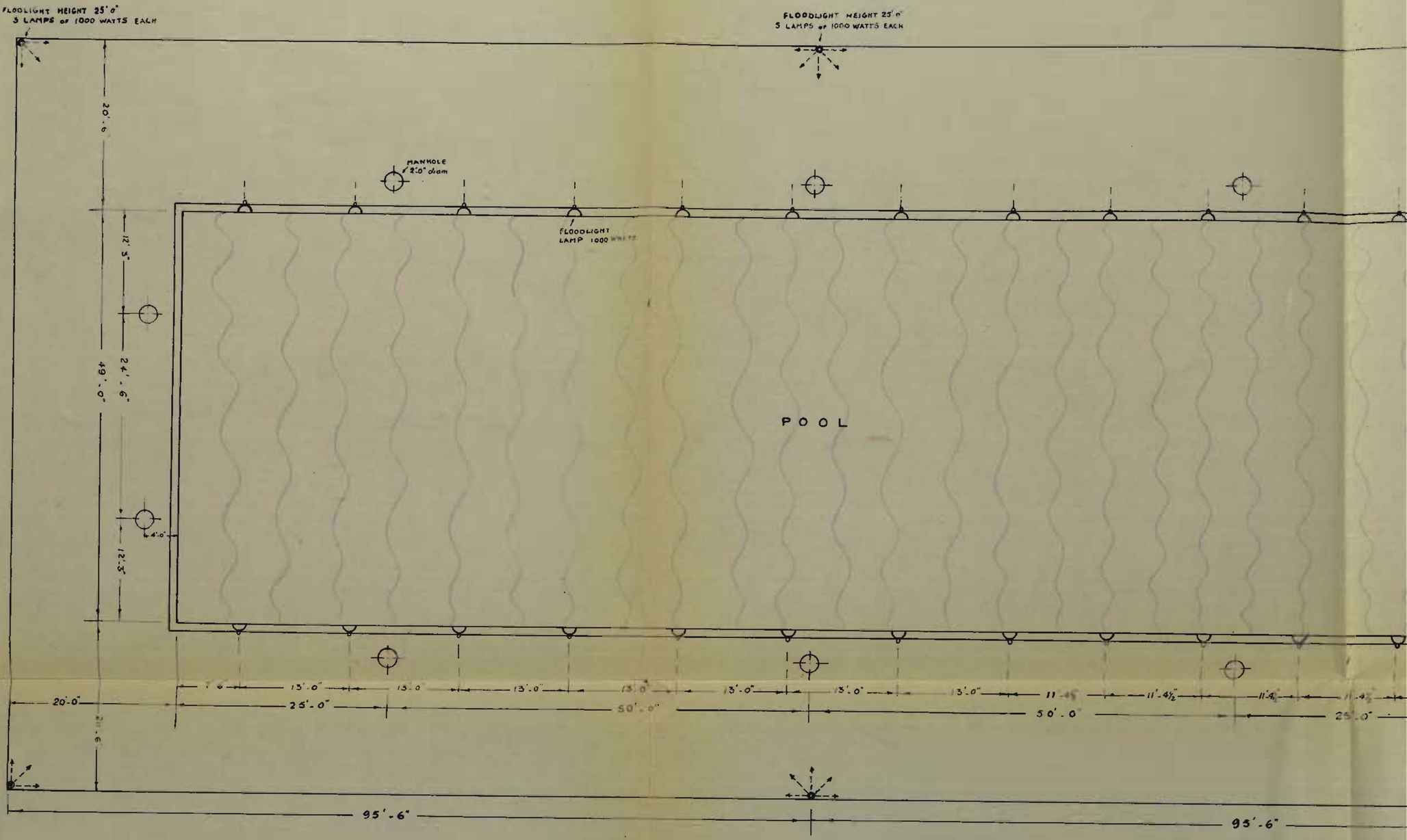
SCHOOL OF ENGINEERING — A.U.B

PROJECT: COMMUNITY SWIMMING POOL

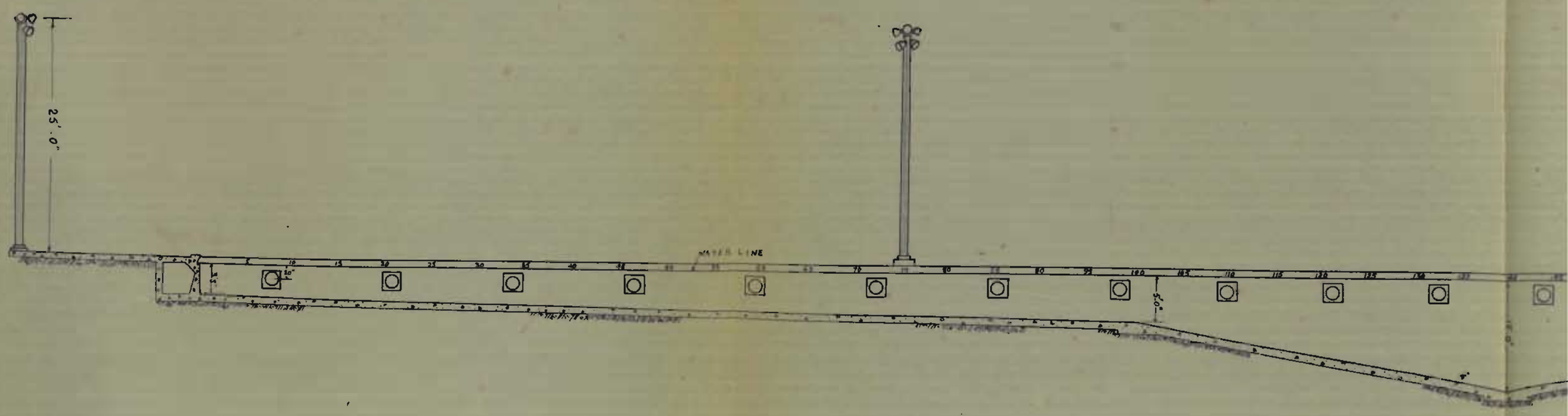
POOL EQUIPMENT

DESIGNED BY PIERRE SIOUFI

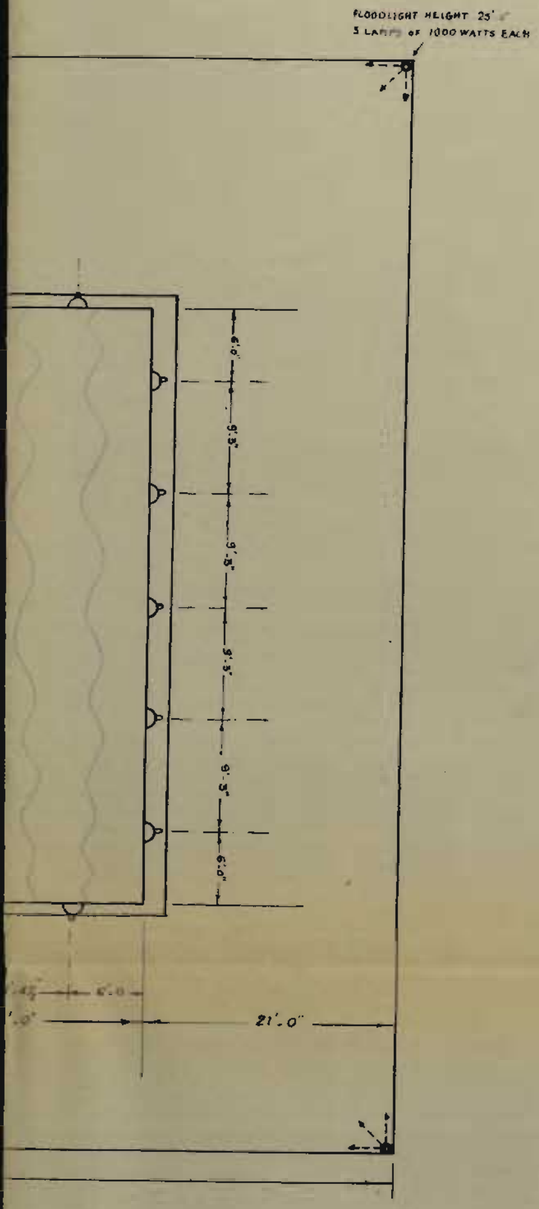
DATE APRIL 27 1953 SCALE 1"=1'-0" SHEET 12 OF 13



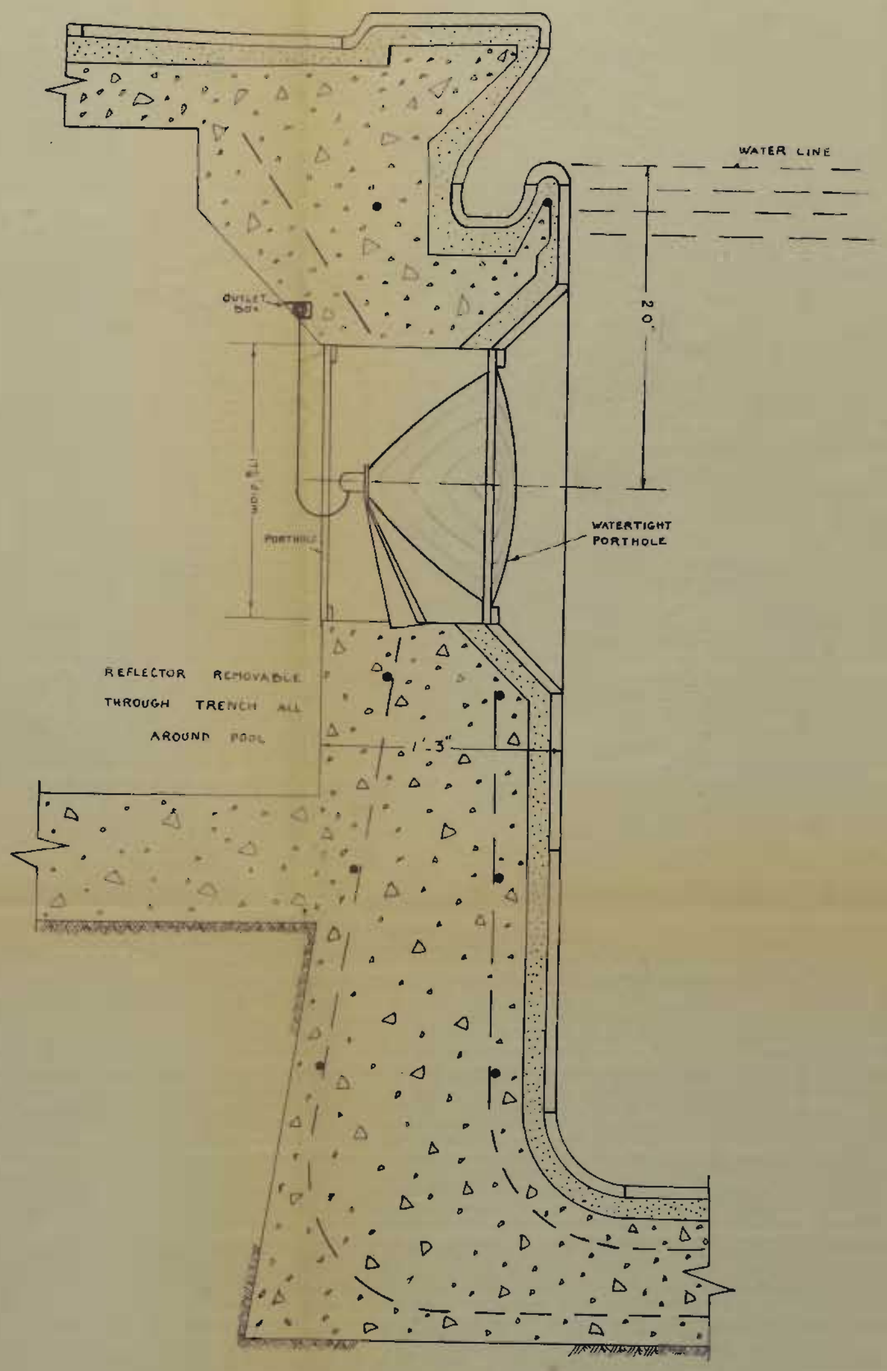
PLAN



SECTION

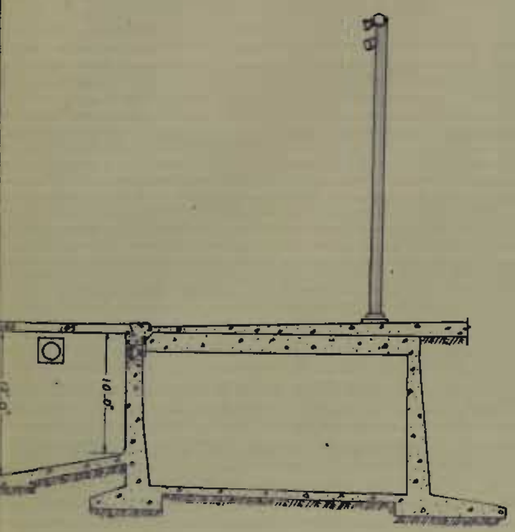


SCALE : 1 cm = 4ft



SECTION THROUGH REFLECTOR

SCALE : 4 cm = 1ft



SCALE : 1 cm = 4ft

SCHOOL OF ENGINEERING - A.U.B.

PROJECT : COMMUNITY SWIMMING POOL

POOL LIGHTING

DESIGNED BY : PIERRE SIOUFI

DATE : APRIL 27, 1953 SCALE : AS SHOWN SHEET 13 OF 13