FINANCING THE STREET-CLEANING PROGRAM

The two most popular plans for financing this city function are (a) the usual property tax, and (b) the gasoline tax. This public service can be justly paid out of the return of gas tax since it maintains streets and highways. It might be possible under this second plan to get the council to vote an increased budget for improvements in the street cleaning, since the cost is not assessed directly against the property.

Since every method of street cleaning has been discussed and the high or low cost of each mentioned, perhaps a comparison of average costs should be made.

<table>
<thead>
<tr>
<th>Method</th>
<th>Average Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beat Patrol — sweeping only</td>
<td>$2.64 per mile</td>
</tr>
<tr>
<td>Beat Patrol — including disposal</td>
<td>3.93 &quot; &quot;</td>
</tr>
<tr>
<td>Gang Sweeping — sweeping only</td>
<td>3.84 &quot; &quot;</td>
</tr>
<tr>
<td>Gang Sweeping — including disposal</td>
<td>5.38 &quot; &quot;</td>
</tr>
<tr>
<td>Machine Sweeping — sweeping only</td>
<td>1.59 &quot; &quot;</td>
</tr>
<tr>
<td>Machine Sweeping — including disposal</td>
<td>2.49 &quot; &quot;</td>
</tr>
<tr>
<td>Flushing</td>
<td>1.49 &quot; &quot;</td>
</tr>
</tbody>
</table>

The average yearly cost per capita for street cleaning is 37 cents. The average cost, per mile of paved street, is $264.00.

Accurate records of performance and costs will help improve efficiency and form a background for sound requests for improvements through additional funds for labor and equipment.

THE DESIGN AND OPERATION OF A MUNICIPAL SWIMMING POOL

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The swimming pool is a newcomer to the field of engineering. The first swimming pool in the United States was opened in 1901. The past decade has witnessed the construction of quite a large number.

Many of the swimming pools designed and constructed in recent years were the result of long-range planning. Generally speaking, however, well-designed pools are in the minority.

Immediately we ask, "Why did this happen?" The only answer is that the designing engineer was not familiar with the needs nor was he granted the time or funds with which to make a study to determine the needs. Usually the city council authorized the construction of a pool—an engineer was retained to design the structure—and the newspapers began to clamor for visible results. Thus, with the pressure on, the engineer turned to standard design features with all their inherent faults and soon presented the town with a set of plans and specifications. I should like to discuss some of these faults together with certain other general features of this topic.
SELECTING THE SITE

Before a line is drawn on the design sheet, certain fundamental questions must be answered. Perhaps the most important is: "What type of person will patronize the pool? Will they be waders, swimmers, divers, or definite combinations of these groups? What is the real interest in swimming in the community?"

Of course, I realize that all designers answer these questions before the design, but for the most part their answers were rough estimates. The proof of the inaccuracy of these estimates is the million-gallon pool in one city with a score of customers, and the small pool in the next city so jammed that one could almost walk across the center of the pool without getting one's feet wet. Unfortunately, it is not possible to obtain accurate information on the expected use of the pool, but opinions of local sports authorities and the experiences of neighboring cities will be helpful.

Most municipal pools are too large. Pools cannot, and must not, be designed to handle Fourth of July loads unless the city wants the pool to be a financial burden—and most cities have all the financial burdens they can carry already. Pools must be designed to handle only the average loads that can reasonably be expected.

The location of the pool is an extremely important consideration. Too often the pool has been located on some plot of ground with no consideration except the fact that the city already owned the site and a couple of hundred dollars would be saved by its selection. Where is the economic justification in saving $500 to $1,000 on a 50- to 100-thousand dollar project by selecting a site which we know is unsuitable?

In choosing a site, several factors should be taken into consideration. The most important as I see the problem are these four:

1. Remember that the largest users of the pool will be children, therefore locate the pool at a point that is accessible to this group. Locate the pool, if possible, in such a manner that it is not necessary for the children to cross heavily-traveled highways or streets in going to or from the pool.

2. Provide for attractive surroundings, but avoid large numbers of trees, as they tend to keep the air cool and are a headache to the operator who must keep the pool clean.

3. Avoid dusty roads, railroads, factories, etc., for the wind will carry large amounts of dirt from them into the pool. For the same reason, avoid placing the parking lot at the side of the pool, for the average high-school youngster with dad's car loves to arrive in a cloud of dust, 75 per cent of which will settle in the pool if the wind is in the wrong direction.

4. Place the pool on a level with the ground or preferably slightly higher. A terraced, sunken pool may look beautiful, but it's no fun to clean up the pool after every rain.
THE DESIGN

The location having been selected, we now turn to the actual design. From a study of the town's temperament, information has been obtained that will be useful to the designer. There are several basic types of pools, and the designer must select the type that will be most useful. If the pool is to be built so that it can be used for competitive swimming meets, careful consideration should be given to the recommendations of sports authorities, for a pool only one inch short will be disqualified.

The type of pool selected will determine most of the other features of the pool and the bath house.

**Depth.** The depth of the pool at various spots and the slope of the bottom are very important features. Generally speaking, a pool designed for mass recreation, the majority of users being non-swimmers, should have a water depth of less than 5 feet for 75 to 85 per cent of the pool area.

The minimum depth of a pool is usually 3 to 3½ feet, with a gentle slope to a depth of 6 feet, whence the bottom slopes very steeply to a depth satisfactory for diving. The slope of the bottom in the shallow area is very important, for it is here that many accidents occur if a slope greater than 1 on 15 is used.

In the diving area, the depth varies from 8 to 16 feet according to the diving board to be used. Perhaps it is important at this point to warn those charged with pool maintenance against installing a high diving board on a shallow pool. Swimming authorities recommend the following minimum depths:

- With a 1-meter springboard the depth should be greater than 8 feet
- With a 3-meter springboard the depth should be greater than 10 feet
- With a 10-meter springboard the depth should be greater than 16 feet

**Steps vs. Ladders.** Many pools have been designed with steps or other projections into the pool. These have been the source of so many accidents that they have been almost entirely eliminated, even in the old pools.

Never, if it can be possibly avoided, use steps or ledges in a pool or pool room. Often, even with the most careful operation, algae will collect on these steps or ledges and make them very slippery. If possible, build the bath house on the same level as the pool walk and use ladders in the pool.

For the maximum amount of safety, ladders should be located on both sides of the pool at the deep end and at the "break". One ladder in the shallow end is usually sufficient. Ladders should be recessed into the wall and sufficient room around the ladder provided for easy cleaning.

**Sidewalks.** Sidewalks are not given enough consideration by pool designers. At first we can hardly realize that sidewalks can be a problem, but the walk around the pool has a very special function that cannot be overlooked.
During the past decade the American public has become very conscious of the value of sun bathing, and the swimming pool seems to be the proper place to get the popular shade of tan. As a result, space must be provided for this activity as well as swimming. Most printed material recommends that walks be at least 4 feet in width, but I am of the opinion that the minimum should be at least 8 feet. Often, in inspecting swimming pools, I have had to pick my way along the edges of the pool very carefully to avoid stepping on prone bodies obtaining the daily dose of sunshine.

All walks should slope away from the pool with adequate drainage provided. If this is not done, water will stand on the walks, become very dirty, and eventually be dragged into the pool.

**Gutters.** Overflow (scum) gutters are usually underdesigned. These gutters must be designed to receive, hold, and carry away all water splashed into them. In addition they have the very necessary side function of providing a hand hold for persons tired of swimming. Thus the designer must consider these features:

1. The gutter must be deep enough so that the bathers' fingers do not touch the bottom when holding onto the gutter.
2. The gutter must be large enough to carry away large volumes of water when the pool is crowded.
3. There must be a sufficient number of drains and the sewer must be large enough to carry all water away rapidly.
4. The gutters must be accessible for cleaning.

**Progress of Pool Design**

All pools constructed today are of the recirculation system type. Before we consider the recirculation system, however, let's stop and examine the history of the development of the modern recirculation type of swimming pool, in order that we may understand more clearly the results to be expected from the recirculation system.

The first swimming pools were of the "fill and draw" type. These pools were filled from a source known to be safe, used for a period of time, and emptied. Very little thought was given at that time to the contamination that might be introduced by the bather into the water.

As these pools became popular, public health authorities began to give the matter some serious thought. After considerable study of the subject, principally through the use of water bacteriology, the authorities realized that the "fill and draw" pool had many disadvantages and that a more satisfactory type should be developed.

This led to the development of the "flowing through" pool. This was based on the principle of continuous dilution by the constant addition of water. This is a sound principle, and is
still satisfactory from a sanitary standpoint provided sufficient water is added.

The "flowing through" pool, however, had many disadvantages from the economic and safety standpoints. In many localities a large supply of satisfactory water was very difficult and expensive to obtain, and often the water was turbid. Swimming-pool water must be very clear, for the life guard must be able to see all persons who have accidentally gone to the bottom of the pool in distress. Another disadvantage of this type of pool was the low water temperature. Most of the "flowing through" pools obtained water from deep wells, and the temperature of the water in the pool was always about 55° F. This, of course, was distressing to all but the most robust customers.

It was at this point that the swimming-pool designer turned to the water-treatment processes for the ideas incorporated into our modern-day "recirculation" pool. In this type of pool the water is continuously recirculated through the pool and the water-treatment mechanism. The treatment facilities consist of a recirculation pump, filters, a chlorinator, a device for adding definite amounts of coagulating chemicals to the water, and the necessary equipment needed for control.

The principle of this type of pool is the same as the "flowing through" pool except that the water removed from the pool is treated and returned to the pool instead of being wasted. With this background, let us now consider the recirculation equipment.

In the recirculation type of pool the water flows from the main drain, placed at the bottom of the pool at the deep end, to the suction of the recirculation pump. This pump gives the water sufficient head to force it through the filters and back into the pool. Usually alum, soda ash, and chlorine are fed into the suction of the pump. Alum and soda ash are used since they form a jelly-like substance on the surface of the filter sand that aids in the clarification of the water passing through the filter. The chlorine is used to sterilize the water.

If properly operated, the water passed through the treatment process is much clearer than make-up water coming directly from the well, and is safe bacteriologically because of the chlorine residual.

After passing through the treatment processes, the water is returned to the pool through the inlets located on the walls. These inlets must be evenly spaced around the entire pool, unless the pool is very small, so that the treated water is evenly distributed over the entire pool.

I shall not attempt to go into the details of design features of the recirculation system, for they form a subject in themselves. Perhaps it is sufficient to say that the system is usually designed to treat the entire contents of the pool completely every 8 hours, and that the present trend is toward a 6-hour turnover.
Bath House

The bath house is often the stepchild of the swimming-pool designer and is very poorly designed. The bath house has a very special function to perform, and some thought must be given to its design. I am thoroughly convinced that the principal reason adults do not patronize municipal pools more is the fact that bath houses are not designed to handle this group as well as children. The average adult will not patronize the local pool when he or she knows that to do so means that clothes will be ruined. Some of the things that should receive attention in the design of a bath house follow:

1. The floor plan should be such that the bather is routed through the building to the pool in a systematic manner. The bath house with the dressing room, shower, and toilets in the same room is definitely in disfavor. No person wants to risk getting a good suit wet because some fellow in the shower becomes playful.

2. The floor should be well drained by the installation of a large number of drains and good floor slopes to these drains. The floor should have a rough surface to prevent slipping.

3. The building should be properly lighted and ventilated.

4. Warm water should be provided for showers. Few people actually like the ice-cold shower.

5. Adequate provision for storage of the bather's clothes while in the pool should be made. The basket normally used for this purpose is not satisfactory to the average adult, for clothes become soiled in the basket.

Of course these are only a few of the many problems faced in designing a bath house, but the remainder are principally matters of good engineering rather than special problems.

Personnel

The selection of personnel is the most important single item of operation. Conscientious individuals always make good operators even if they know very little about swimming pools when they start on the job. Lazy people never make good operators regardless of how much they know about the job. Personnel must be impressed on hiring that they have a very important job to do and that the pool is not some place to loaf and get paid for it.

The public is always impressed by cleanliness. The most important thing is to keep the pool clean at all times. Do not permit persons to eat candy bars, etc., inside the pool enclosure. Candy wrappers, paper, and leaves can ruin the appearance of a pool in a very short time. People in street clothing carry a great deal of dirt into the pool enclosure, and for that reason should be kept outside the fence.

People as a rule are also very particular about other people who normally patronize the pool. If you allow a person with
an open sore to swim in the pool, many persons will see or hear about it and will cease to be customers. The same applies to persons entering the pool without a cleansing shower. It takes courage and finesse to send a person back to the showers or to refuse him use of the pool, but occasionally it must be done.

Roughhouse playing and the child that stays in the water all day are also problems that face the operator. Roughhouse playing in a pool is very dangerous and must be controlled or serious accidents will occur. The operator, however, must use judgment to determine what to allow, for otherwise all the fun will be taken out of swimming and the crowd will go somewhere else. Long periods in the water are not desirable, and the operator must know when to advise persons to leave the pool. Children often stay in a pool until they turn a bluish color, and this is definitely unhealthful.

**State Regulations**

The State Board of Health regulations require that the water be in good condition and that general cleanliness be maintained. Pools are required to keep a chlorine residual of at least 0.4 p.p.m. at all times and a pH between 7.4 and 7.6.

The reason for the chlorine residual is obvious since chlorine is so universally used for sterilization. The meaning and use of pH, however, may not be so well understood.

As an expression pH is used to designate the concentration of hydrogen ions in a solution, or in other words it is a measure indicating the acid or base reaction of a solution and its intensity. It has been found that the pool operates best within the above limits. Water with a low pH, or acid reaction, causes irritation of the eyes, nose, and skin, and the bather begins to complain that the chlorine is too strong when in reality the chlorine residual may be proper and the pH is to blame.

Turbidity is a self-evident factor. We have never required "sparkling" water, but have been satisfied if the life guard is able to see the bottom of the entire pool.

At first it may seem difficult to keep the pool water in perfect condition at all times; but if the recirculation system is operated properly, it can be done very easily. This recirculation system, like every other piece of equipment, will do the job that it is designed to do if you understand its workings and give it a normal amount of care. All recirculation systems are different and have different requirements, so I do not wish to go into detail on this item.

The Bureau of Sanitary Engineering of the Indiana State Board of Health is always glad to have one of its engineers visit pool operators and help in any way possible. Each year we attempt to visit all pools during the first month of operation to assist and instruct new personnel in the operation of the pool.
The remainder of the operation problems are principally matters of good common sense and cleanliness. Regulations regarding footbaths, showers, etc., should be followed closely since there is urgent need for them.

Since this is a municipal group, I want to leave one thought with you in closing. A town should never build a swimming pool with the idea of making money. Very few swimming pools make money, and many of them lose money year after year. However, I feel that it is the municipality's duty to provide funds to operate a pool if it can do so. It is every bit as important as the general park program.