YANKTON, SOUTH DAKOTA
MUNICIPAL SWIMMING POOL

On Wednesday, May 24, 2006, representatives of our firm met with city staff and officials to discuss the pool. The purpose of the site visit was to observe the pool, discuss the improvements that were made in 1977, describe how the pool was to be operated based on the improvements in 1977, and listen to the staff speak about the current pool problems the city has been dealing with the last few years.

The main problem and biggest concern is the pool has been leaking. Due to the leaking, large amounts of makeup water must be added each day; thus, the pool water temperature is uncomfortable to the patrons. There are really only two places the pool can leak water. The first is the concrete pool or tank itself and the second is the piping.

Concrete Pool or Tank

The city had the concrete for the pool tested in the fall of 2005. The testing indicated that overall, the concrete is in good condition. The report does address some blow out problems that the pool has had due to wooden supports of the reinforcing steel. These blow outs have been repaired and the testing of the repairs indicates the repairs are being done properly. Basically, the report finds the pool tank is in good structural condition and it does not need to be replaced. As blow outs, or spalling, occur, they should continue to be repaired as in the past.

The pool walls and the shallow area floor are in good condition and do not need to be replaced, other than the blow outs needing repair as they happen. The joints should be recaulked every year as required before the pool is reopened.

The deep end or diving area appears to have the most problems. This area is below the ground water and is subject to hydrostatic pressure, which can result in concrete cracking and joint failure when the diving area does not contain water to equalize the ground water pressure. This will result in heaving of the floor slabs, causing cracking and joint failure. In order to relieve the problems with hydrostatic pressure from the high ground water, the pool must be kept full of water even during the winter months to prevent the upward forces from causing damage to the diving area. This can be accomplished by maintaining the water level in the deep end at the same elevation as the ground water, or installing hydrostatic relief valves in the main drains which allow water to enter the pool when the ground water pressure exceeds the pressure in the pool. This allows the water to enter the pool and stabilize at the same elevation as the ground water. When water is kept in the pool, the depth needs to be sufficient enough to prevent water in the drain piping from freezing; typically, three to four feet is sufficient.

The deep end does have some large cracks in the bottom that leak, as well as leakage from some of the concrete joints due to the high water table. The staff has a difficult time trying to caulk the cracks and joints due to the pressure from the groundwater forcing water into the pool through these cracks and joints not allowing the caulk to cure and stick in the voids. There are a couple of solutions the city can use to attempt to resolve this problem.

1. Remove and replace the deep end floor and main drain piping. The piping would be replaced at this time since, even though the piping that was televised appeared to be in good shape, it would be a considerable cost savings to replace the piping when the concrete is torn out rather than to do it again later.

   Hydrostatic relief valves should also be installed at this time in the main drains to allow pressure relief when the pool is empty. The main drain piping should also be connected and installed to run directly through the drains into the filter room, which would allow easy cleaning, inspection, and testing.

   The area directly beneath the new concrete should be filled with 12 to 18 inches of crushed rock with a filter fabric material to prevent soil and silt from plugging the voids in the rock base. Drain tile should also be installed in this rock layer to allow water to drain through the drain tile to a sump pit where it can be pumped out during those times when the pool is drained for repairs and painting. This may not solve the problem of water entering the pool during painting, but it is rather inexpensive to install while the concrete is torn out for replacement. The crushed rock also provides a good solid base for the concrete to be placed on during construction, thus, alleviating the need for dewatering and drying out the subgrade materials.

2. If the drain tile can not provide adequate draining of the area during pool repair, then dewatering wells and pumps would need to be constructed to lower the water table in the immediate area to allow for the proper repair and maintenance of the pool. This is an option after the drain tile option has been tried. Dewatering of the area will result in large amounts of water being pumped that will need to discharge to the closest storm sewer system. This will require either permanent buried piping from the wells, which would be located around the deep end to the storm sewer, or installing temporary piping above ground during the pumping which could last approximately 7 to 10 days.

3. A third option would be to tear out the entire deep end floor or hopper, which would include the sloped floors, and replace this and the bottom drain and floor. This would replace most of the joints; however, yearly maintenance of the joints will continue, but this will alleviate the majority of the water loss due to poor joints and cracks.

4. The fourth, and most controversial option, would be to tear out the deep end as discussed in item No. 4, but eliminate the 12-foot depth and diving boards. The new depth would be 5 or 6 feet, which lifts the floor depth 6 to 7 feet higher than the current floor elevation. This eliminates most of the problems with the groundwater since the deep end is now at a much shallower elevation. However, this would eliminate all diving in the pool, including from the deck surface.

In summary, the shallow end and the pool walls are in good condition and do not need to be replaced. The deep end does need repair, and the main drain piping should be replaced at the same time.

Wading Pool

The wading pool concrete is also in good condition and does not require replacement. However, the piping from the wading pool is tied into the main pool piping and should be separated, with its own pump and filter system. The drain line from the wading pool seems to be plugged and not working properly. The wading pool should have all its piping replaced from the main drain and gutter system, as well as the return water line from the new filter and pump. The wading pool requires a two-hour turnover rate which can only be accomplished by installing a separate filter and pump.

While this work is being done, the city may want to consider installing some wading pool features such as a rain drop and small slide. If these are to be installed, the correct size pump and filter can be installed without replacement in the future when the amenities are added.

Main Pool Piping and Filtration System

There are only a few places where the pool piping can leak on this pool. The main gutter system is composed of stainless steel which provides for both the pool overflow gutter (skimmer) system, and the return pool piping and pool inlets. As long as this system stays intact, the only place where piping is located is from the adaptor boxes from the stainless steel gutter system to the filter and return piping. These adapter boxes are also made of stainless steel and are located beneath the deck between the gutter system and the filter room. The pool deck should be removed in this area and the pool piping pressure tested. If the piping does not hold pressure from the side of the pool at the adapter boxes to the filter and pumps, then all of the piping should be replaced. The main drain line can also be a source of leakage; however, this item has already been addressed under the pool section.

Some of this piping has been in use since 1977, and some of it is still part of the original construction. Different parts have been replaced; however, this piping has probably served its useful life and should all be replaced at the same time.

The filter system is composed of two high rate rapid sand filters, each with its own pump. These filters were installed as part of the 1977 pool improvements. Both the filters and pumps have been in service for almost 30 years and have exceeded their design life.

Nothing has ever been done to the filters in almost 30 years. It was mentioned the filters need to be back washed more than once daily. This indicates that they are not working properly and need to either be repaired or replaced. The filter media needs to be changed out, and the filter under drain system, laterals, and face piping should also be replaced.

These filters met the design requirements in 1977, and at a 15 gpm/sq. ft. filter rate will provide a six-hour turn over of the pool. The existing pumps cannot handle the required flow rate and need to be replaced to provide the required six-hour turn over. If the existing filters can not be repaired because of their condition or lack of replacement parts, then new filters should be installed.

Miscellaneous Pool Items

There were discussions concerning the coldness of the pool water due to the pool leaking and cold makeup water required to maintain the pool level. Except for pool heaters, which are primarily gas for this large of a pool, we have not seen any type of solar type heater that could provide the needed capacity to be able to raise the pool water temperature. As we mentioned, we still have not found a pool heater that seems to last for more than five years. They can last longer or even shorter, depending on the maintenance; however, even with good maintenance, after five years things just seem to start falling apart. Putting chlorinated water through a heater is very hard on the commercial grade pool heaters and they just do not seem to last. We will attempt to get a cost on a pool heater. The largest heater I have information on would only raise the pool water 20 degrees. The size of this unit is approximately nine feet long, by four feet wide, and five feet tall. This does not include the piping, hood, and flue covers.

The second item that we noticed was the pool still drains to the city's sanitary sewer system. This needs to be changed and pool water being drained, as well as the backwash water, should go to the storm sewer. However, things are in the works to change storm water discharge criteria, so we would recommend waiting to see how this develops before any changes are made.

Summary of On-Site Meeting

The swimming pool is in good structural shape and does not need to be replaced. Some work and replacement of the pool is needed in the diving area to allow pool maintenance and painting. A few options have been discussed concerning the diving area improvements.

The wading pool is also in good shape; however, the wading pool piping needs to be replaced. A separate filter and pump system should be installed to serve only the wading pool.

The filters need to be repaired with new laterals, distributor heads, collectors, and media. If the filters can not be repaired, they should be replaced along with new recirculation pumps.

Some areas of the pool decks will need to be removed and replaced as part of the pool piping replacement. The city may want to consider replacing all the pool decking in order to have the decks slope away from the pool to meet current requirements. It was noted in the pool report there were numerous voids beneath the decks which should be addressed.

Budget Cost Estimates

1. Remove and replace main drain area, install drain tile, rock and filter fabric $60,000
2. Remove and replace all of diving tank floor, including main drain area, installing drain tile, rock and filter fabric $90,000
3. Remove and replace main drain piping along with option Nos. 1 or 2 ..... $30,000
4. Construct shallower deep end area and main drain lines over existing deep end $125,000
5. Install new wading pool filter and pump, new return line piping, and fix fountain spray heads $25,000
6. Install rain drop fountain in wading pool $20,000
7. Renovate existing pool filters, install new media and internal parts if available ..... $20,000 (Work to be completed by city forces except for steel cutting and welding.)
8. Install two new 102-inch diameter filters $45,000
9. Install new recirculation pumps $20,000
10. Install pool heater, not including gas line to bathhouse $35,000