Site Analysis, Programming Study

PAGE PARK POOL
Bristol, Connecticut

TLB Architecture, LLC
92 West Main Street
Chester, Connecticut

February 16, 2018

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I. Introduction

I. Introduction

The City of Bristol, acting through the Department of Parks and Recreation, has commissioned a Study to evaluate the Page Park Pool Facility, located on King Street, within a fully developed Park and across the street from Bristol Eastern High School.

The park is a multi-use facility with a boundless playground, splash pad, disc golf course, Page Park lagoon, five lighted tennis courts, baseball diamond, lighted softball field, lodge building, pavilion, picnic areas, regular playground and a toddler playground, in addition to the swimming pool facility.

The pool complex was constructed around 1950 and has served the citizens of Bristol in its current configuration for nearly seven decades.

The swimming pool facility consists of a rectangular pool that is approximately 120-feet long x 75-feet wide (25-yard lap pool). A tunnel surrounds the pool - concrete decks cap the tunnel and continue on grade past the outer tunnel walls. The tunnels are not original to the construction and are believed to have been added in a 1970's vintage renovation. The pool is surrounded by chain-link fence on three sides and is bound by a two-level bathhouse to the west.

The bathhouse has its main entrance on the upper level. Toilet and shower facilities, space for staff and lifeguards, and the building and pool mechanical systems are located on the lower level. The roof over the lower level serves as a promenade overlooking the pool below. At some point after the initial construction of the building, a barrel-vaulted canopy roof was added to the promenade.

Originally, the primary pool entrance was located at the lower level, at the north and south sides of the building. At some point, access was redirected to the upper level resulting in a disparity between how disabled patrons and able-bodied patrons access the pool.

In the summer of 2017, TLB Architecture, LLC of Chester, CT was retained by the City of Bristol to provide a review of the swimming pool, bathhouse, decks and associated pool and building systems, including the pool's recirculation, filtration and chemical control systems.

A comprehensive structural assessment of the pool shell, pool surfaces and deck, inclusive of soundings and invasive structural analysis was also performed.

The goal of this effort is to identify deficiencies related to the following:

- System operation and compliance with applicable Codes, including DPH
- Anticipated life cycle of existing or recommended equipment
- Anticipated life cycle of Swimming Pool and related systems and assemblies

In addition to the analysis of existing conditions, TLBA will provide design options related to recommended areas of new construction or renovation, for near and long-term goals of the facility.

I. Introduction

Aerial Photo—Taken September 1951 (Source UCONN-MAGIC)

Aerial Photo—2016 (Source Bing Maps)

I. Introduction

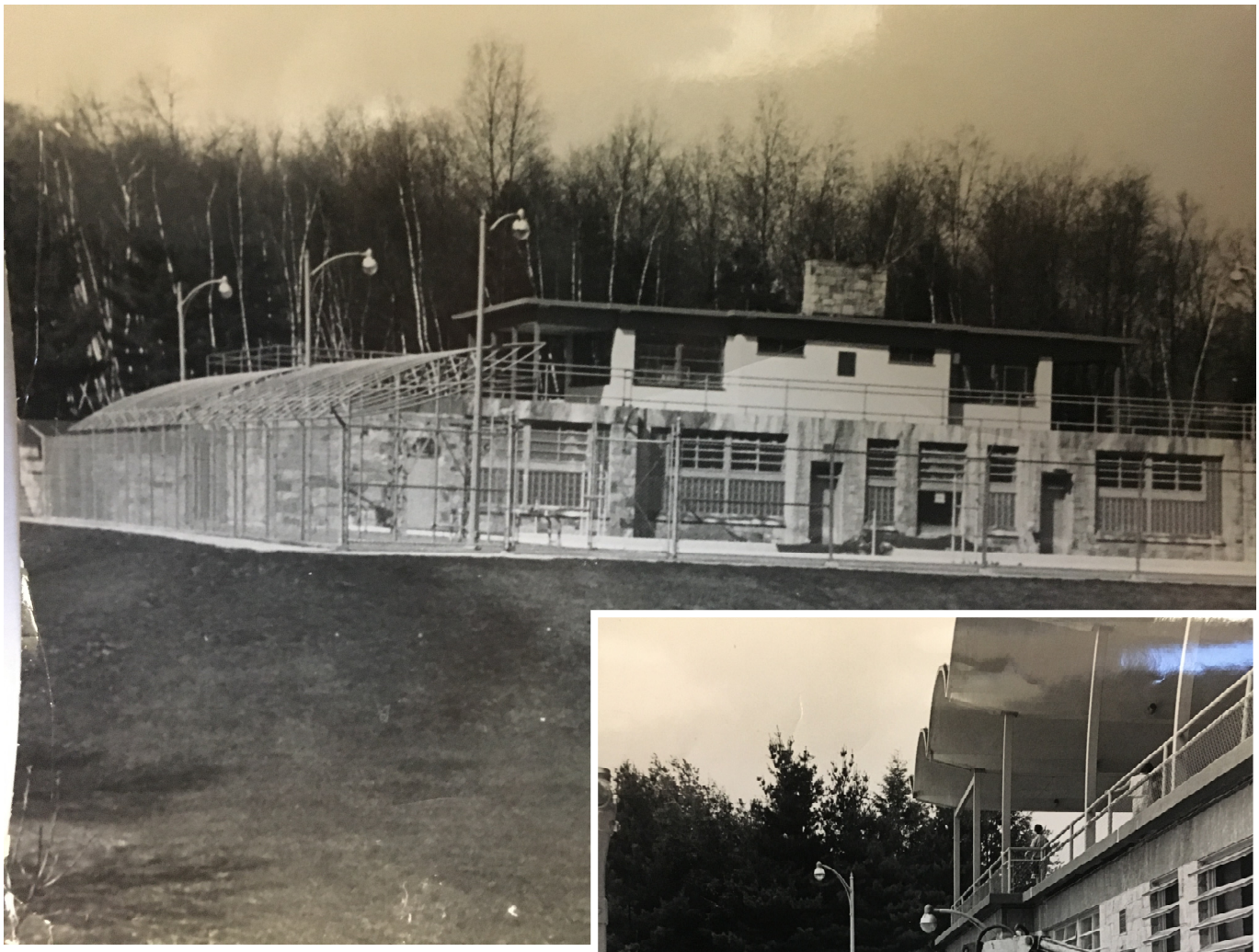

Photo Above: the date is unknown, but likely in the 1950's shortly after opening. The pool had both 1-meter and 3-meter diving, under a shade canopy at the south side of the pool.

Photo Right: This appears to be a photo during the renovations that took place in 1976. Note the tunnel that surrounds the pool does not exist in this photo. The tunnel where the workers are standing is in line with the lower level of the Filter Room, where the original DE filter was located. Also note the replacement of the flat roof (above) with the barrel-vaulted roof.

II. Executive Summary

II. Executive Summary

A. NARRATIVE

The Page Park Swimming Pool is in remarkably good condition for its age and the heavy use it's gotten over the years. This is a testament to the quality of the original construction as well as the diligent maintenance over nearly seven decades of use. In order for the pool and bathhouse to continue to serve its purpose, a number of issues need to be addressed immediately, while others can be deferred to allow for proper planning and budgeting of capital expenditures.

Recognizing that municipal budgets are tight and the immediate expenditure of significant money is unlikely, we have structured this report to identify the work we believe is immediate in nature, followed by Options for renovations and major maintenance.

Work identified as an Immediate Recommendation includes items required for Code Compliance, Life Safety, Health Department Compliance or to repair or replace materials and equipment that is at or beyond its useful life, or in imminent risk of failure.

The options included in this report can be taken in whole or in part, and elements of one can be mixed with elements of others to provide for an ideal facility, within the limits of budgetary constraints.

Chapter III, "Existing Conditions Analysis" identifies issues found with the existing facility and Chapter IV, "Recommendations" identifies our suggested remedies for those issues. On the following pages are the Opinions of Probable Cost for the recommendations and options described in this report.

This report budgets the execution of renovations utilizing painted concrete surfaces, as well as an option employing a Stainless Steel panelized system, within the existing pool shell. The benefit of the latter is reduced maintenance, long life-cycle and extended warranty.

On the following pages are TLBA's Opinion of Cost for various repair and renovation options. These are prepared based on our assessment of currently available information. Verification of anticipated cost will be required during subsequent design phases.

Page Park Pool - Bristol, CT
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IMMEDIATE RECOMMENDATIONS - Temporary Repairs

	Item	Unit	Quantity	Unit Cost	Item Cost	Total Cost
A.	BUILDING					
1	Repair Concrete at Promenade Overhang	Allow	1	20000	20000	$23,540.00
B.	POOL and POOL SYSTEMS					
1	Reduce Flow Rate to 950 GPM	Allow	1	0	0	$0.00
2	Install Chemical Control System and cO2	Allow	1	0	0	$0.00
3	Misc. Repairs to Recirc / Filtr / Chem Ctrl Systems	Allow	1	2500	2500	$2,942.50
4	Electrical Repairs at Filter Area	Allow	1	3000	3000	$3,531.00
5	Scrape and Power Wash Pool	SF	12800	2	25600	$30,131.20
6	Replace Expansion Joints-Direct Replacement	LF	820	15	12300	$14,477.10
7	Repaint Pool - 1 Coat, Rubber	SF	12800	3	38400	$45,196.80
	SUBTOTAL PROBABLE CONSTRUCTION COST					$119,819
	Project Soft Costs					
	A/E Services					$11,981.86

Notes:
1. Total Cost Column for Construction Cost Items includes General Contractor's Overhead and Profit (7%), and General Conditions (10%) in 2018 dollars.
2. Not included in this estimate: Sitework and Utilities, Interior Work

Page Park Pool - Bristol, CT
February 2018

IMMEDIATE RECOMMENDATIONS - Long-Term Repairs

	Item	Unit	Quantity	Unit Cost	Item Cost	Total Cost
A.	BUILDING					
1	Repair Concrete at Promenade Overhang	Allow	1	20000	20000	$23,540.00
B.	POOL and POOL SYSTEMS					
1	Reduce Flow Rate to 950 GPM	Allow	1	0	0	$0.00
2	Install Chemical Control System and cO2	Allow	1	27500	27500	$32,367.50
3	Misc. Repairs to Recirc / Filtr / Chem Ctrl Systems	Allow	1	2500	2500	$2,942.50
4	Electrical Repairs at Filter Area	Allow	1	3000	3000	$3,531.00
5	Abrasive Blast Pool	SF	12800	4	51200	$60,262.40
6	Epoxy Inject cracks	LF	240	185	44400	$52,258.80
7	Replace Expansion Joints-Direct Replacement	LF	500	100	50000	$58,850.00
8	Replace Expansion Joints-Sawcut and Replace	LF	320	200	64000	$75,328.00
9	Repaint Pool	SF	12800	12	153600	$180,787.20
10	Replace Main Drain Covers	EA	3	1200	3600	$4,237.20
	SUBTOTAL PROBABLE CONSTRUCTION COST					$494,105
	Project Soft Costs					
	A/E Services					$49,410.46

Notes:
1. Total Cost Column for Construction Cost Items includes General Contractor's Overhead and Profit (7%), and General Conditions (10%) in 2018 dollars.
2. Not included in this estimate: Sitework and Utilities, Interior Work

Page Park Pool - Bristol, CT
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	Item	Unit	Quantity	Unit Cost	Item Cost	Total Cost

OPTION 1

A. BUILDING

1	Repair Concrete at Promenade Overhang	Allow	1	20000	20000	$23,540.00

B. POOL and POOL SYSTEMS

1	Modify Recirc / Filtr / Chem Ctrl Systems (reduced volume)	Allow	1	2500	2500	$2,942.50
2	Install Chemical Control System and cO2	Allow	1	27500	27500	$32,367.50
3	Electrical Repairs at Filter Area	Allow	1	3000	3000	$3,531.00
4	Abrasive Blast Pool	SF	10200	4	40800	$48,021.60
5	Epoxy Inject Cracks	LF	135	185	24975	$29,395.58
6	Replace Expansion Joints-Direct Replacement	LF	500	100	50000	$58,850.00
7	Replace Expansion Joints-Sawcut and Replace	LF	160	200	32000	$37,664.00
8	Fill Hopper with Stone	CY	780	32	24960	$29,377.92
9	New 5-foot Deep Mat Slab	SF	2625	12	31500	$37,075.50
10	New Main Drains and Piping	Allow	1	15000	15000	$17,655.00
11	Repaint Pool	SF	12400	12	148800	$175,137.60

SUBTOTAL PROBABLE CONSTRUCTION COST $495,558

Project Soft Costs

A/E Services						$49,555.82

Notes:
1. Total Cost Column for Construction Cost Items includes General Contractor's Overhead and Profit (7%), and General Conditions (10%) in 2018 dollars.
2. Not included in this estimate: Sitework and Utilities, Interior Work

Page Park Pool - Bristol, CT
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	Item	Unit	Quantity	Unit Cost	Item Cost	Total Cost

OPTION 1A

A. BUILDING

1	Repair Concrete at Promenade Overhang	Allow	1	20000	20000	$23,540.00

B. POOL and POOL SYSTEMS

1	Modify Recirc / Filtr / Chem Ctrl Systems (reduced volume)	Allow	1	2500	2500	$2,942.50
2	Install Chemical Control System and cO2	Allow	1	27500	27500	$32,367.50
3	Electrical Repairs at Filter Area	Allow	1	3000	3000	$3,531.00
4	Abrasive Blast Pool	SF	0	4	0	$0.00
5	Epoxy Inject Cracks	LF	0	185	0	$0.00
6	Replace Expansion Joints-Direct Replacement	LF	0	100	0	$0.00
7	Replace Expansion Joints-Sawcut and Replace	LF	0	200	0	$0.00
8	Fill Hopper with Stone	CY	780	32	24960	$29,377.92
9	New 5-foot Deep Mat Slab	SF	2625	10	26250	$30,896.25
10	New Main Drains and Piping	Allow	1	15000	15000	$17,655.00
11	Repaint Pool	SF	0	12	0	$0.00
12	New Myrtha Stainless Steel Panel System	Lump Sum	1	550000	550000	$647,350.00

SUBTOTAL PROBABLE CONSTRUCTION COST $787,660

Project Soft Costs

A/E Services					$78,766.02

Notes:
1. Total Cost Column for Construction Cost Items includes General Contractor's Overhead and Profit (7%), and General Conditions (10%) in 2018 dollars.
2. Not included in this estimate: Sitework and Utilities, Interior Work

Page Park Pool - Bristol, CT
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	Item	Unit	Quantity	Unit Cost	Item Cost	Total Cost

OPTION 2

A. BUILDING

1	Repair Concrete at Promenade Overhang	Allow	1	20000	20000	$23,540.00
2	Renovate Lower Level	SF	4500	150	675000	$794,475.00
3	Renovate Upper Level	SF	1	100	100	$117.70

B. POOL and POOL SYSTEMS

1	Replace Recirc / Filtr / Chem Ctrl Systems	Allow	1	125000	125000	$147,125.00
4	Renovate Pool to Provide Zero-Depth	SF	4125	100	412500	$485,512.50
4	Provide Stainless Steel Perimeter Gutter	LF	390	150	58500	$68,854.50
4	Abrasive Blast Pool	SF	5000	4	20000	$23,540.00
5	Epoxy Inject Cracks	LF	75	185	13875	$16,330.88
6	Replace Expansion Joints-Direct Replacement	LF	200	100	20000	$23,540.00
7	Replace Expansion Joints-Sawcut and Replace	LF	75	200	15000	$17,655.00
8	Fill Hopper with Stone	CY	780	32	24960	$29,377.92
9	New 5-foot Deep Mat Slab	SF	2625	12	31500	$37,075.50
10	New Main Drains and Piping	Allow	1	15000	15000	$17,655.00
11	Replace Decks Over Tunnels	SF	2500	16	40000	$47,080.00
11	Replace Decks on Grade	SF	3800	9	34200	$40,253.40
11	Repaint Pool	SF	12400	12	148800	$175,137.60

C. SITE IMPROVEMENTS

1	Grading and Walkway form Parking	Allow	1	45000	45000	$52,965.00
2	Renovate Lower Level Parking	Allow	1	15000	15000	$17,655.00
3	Retaining Walls	Allow	1	20000	20000	$23,540.00
4	Landscaping	Allow	1	10000	10000	$11,770.00

SUBTOTAL PROBABLE CONSTRUCTION COST $2,053,200

Project Soft Costs

A/E Services					$205,320.00

Notes:
1. Total Cost Column for Construction Cost Items includes General Contractor's Overhead and Profit (7%), and General Conditions (10%) in 2018 dollars.
2. Not included in this estimate: Sitework and Utilities, Interior Work

Page Park Pool - Bristol, CT
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	Item	Unit	Quantity	Unit Cost	Item Cost	Total Cost

OPTION 2A

A. BUILDING

1	Repair Concrete at Promenade Overhang	Allow	1	20000	20000	$23,540.00
2	Renovate Lower Level	SF	4500	150	675000	$794,475.00
3	Renovate Upper Level	SF	1	100	100	$117.70

B. POOL and POOL SYSTEMS

1	Replace Recirc / Filtr / Chem Ctrl Systems	Allow	1	125000	125000	$147,125.00
4	Renovate Pool to Provide Zero-Depth (General Construction)	SF	4125	50	206250	$242,756.25
4	Provide Stainless Steel Perimeter Gutter	LF	0	150	0	$0.00
4	Abrasive Blast Pool	SF	0	4	0	$0.00
5	Epoxy Inject Cracks	LF	0	185	0	$0.00
6	Replace Expansion Joints-Direct Replacement	LF	0	100	0	$0.00
7	Replace Expansion Joints-Sawcut and Replace	LF	0	200	0	$0.00
8	Fill Hopper with Stone	CY	780	32	24960	$29,377.92
9	New 5-foot Deep Mat Slab	SF	2625	10	26250	$30,896.25
10	New Main Drains and Piping	Allow	1	15000	15000	$17,655.00
11	Replace Decks Over Tunnels	SF	2500	16	40000	$47,080.00
12	Replace Decks on Grade	SF	3800	9	34200	$40,253.40
13	Repaint Pool	SF	0	12	0	$0.00
14	New Myrtha Stainless Steel Panel System	Lump Sum	1	680000	680000	$800,360.00

C. SITE IMPROVEMENTS

1	Grading and Walkway form Parking	Allow	1	45000	45000	$52,965.00
2	Renovate Lower Level Parking	Allow	1	15000	15000	$17,655.00
3	Retaining Walls	Allow	1	20000	20000	$23,540.00
4	Landscaping	Allow	1	10000	10000	$11,770.00

SUBTOTAL PROBABLE CONSTRUCTION COST $2,279,567

Project Soft Costs

A/E Services					$227,956.65

Notes:
1. Total Cost Column for Construction Cost Items includes General Contractor's Overhead and Profit (7%), and General Conditions (10%) in 2018 dollars.
2. Not included in this estimate: Sitework and Utilities, Interior Work

Page Park Pool - Bristol, CT
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ADDITIONAL IMPROVEMENTS

	Item	Unit	Quantity	Unit Cost	Item Cost	Total Cost
A.	Improvdements					
1	Water Slide	EA	1	125000	125000	$147,125.00
2	Climbing Wall	EA	2	22000	44000	$51,788.00
3	Spray Features at Zero-Depth	EA	4	12000	48000	$56,496.00
4	Shade Structures	EA	3	25000	75000	$88,275.00
5	Expand Fenceline, Add Grass	Allow	1	35000	35000	$41,195.00
6	Splash Pad	SF	1500	175	262500	$308,962.50
	SUBTOTAL PROBABLE CONSTRUCTION COST					$693,842
	Project Soft Costs					
	A/E Services					$69,384.15

Notes:
1. Total Cost Column for Construction Cost Items includes General Contractor's Overhead and Profit (7%), and General Conditions (10%) in 2018 dollars.
2. Not included in this estimate: Sitework and Utilities, Interior Work

III. Existing Conditions Analysis

III. Existing Conditions Analysis

A. SITE

Page Park is a fully developed, municipally owned park located off King Street, in the eastern half of Bristol, directly across the street from Bristol Eastern High School. There are also entrances from Moody Street, Page Avenue and Woodland Street. The park is constructed on land donated to the City by DeWitt and May Rockwell in 1933. While this analysis focuses on the swimming pool facility, it is important to understand the relationship between the aquatic programming and the balance of the park.

The swimming pool sits atop a hill that rises to the west from a large field off King Street. This setting gives the pool a certain prominence and visual interest, as well as providing natural separation of program elements within the park. This topography, however, also creates challenges with regard to handicapped accessibility to the current bathhouse and pool, as well as challenges with regard to any expansion of the facility.

View looking west from the ballfields near King Street.

III. Existing Conditions Analysis

A. SITE (continued)

The site improvements surrounding the pool consist of an eight-foot high galvanized steel chain-link fence at the full pool perimeter with a concrete curb. The pool deck fills the space between the fence and the pool and there is a concrete mow-strip/walkway outside the fence line. The pool is surrounded by open lawns and mature trees. Lawns in many areas are difficult to maintain because of the foot traffic and the fact they are under the canopy of the trees. (Photo, Top)

Stone retaining walls at both ends of the building terrace the grade to allow easier access between levels. The stone walls are in good condition with no signs of distress. The concrete stairs and walk-ways are worn and in need of replacement or significant repair in the near future. Railings are also in need of repair or replacement. (Photos, Middle and Bottom)

Large expanses of bituminous paving at the entry façade of the building is visually obtrusive and seemingly unnecessary. Removal of the bituminous in favor of a more park-like entry is suggested. This improvement could include defined pedestrian paths, landscaping, lighting and signage. (Photo, Top, next page)

III. Existing Conditions Analysis

A. SITE (continued)

Above: Paving at entrance to bathhouse. A plan for improved walkways and landscaping, lighting and signage is recommended.

Right: Area to the south of the pool, looking east.

III. Existing Conditions Analysis

B. BUILDING

The bathhouse building, along with the pool, was constructed around 1950. From what we've been able to determine, the original building was a single story, with the primary access at the lower level, across the pool deck. The roof was a flat roof with a view over the pool and to the fields to the east. Some time prior to 1965, an upper level Lobby was constructed and the circulation pattern changed to have the primary access at the upper level. A barrel-vaulted canopy was added over the flat roof giving the building its distinctive architectural character. It appears the concrete barrel-vaulted roof was initially constructed with the concrete as the roof finish, but at some point, it was decided to add a membrane roofing systems over the concrete, on what appears to be a wood sleeper system, with a vented cavity.

The building envelope was not evaluated in detail, and no structural testing was completed. Based on our observations, it appears the envelope is in generally good condition, with a couple of notable exceptions.

View looking north from the main entrance road into the Park.

III. Existing Conditions Analysis

B. BUILDING

The concrete deck which serves as the roof of the bathhouse and the floor of the promenade is showing signs of significant decay and should be addressed in the near term. In many areas, particularly along the eastern edge where the roof overhangs the bathhouse wall below, deterioration is such that concrete reinforcing is exposed and significantly rusted. Concrete is split, cracked and spalling in many areas.

This deterioration will eventually result in failure of portions of the slab over time, but in the more near term may cause loosening of the railings, which are connected directly to the slab, and protect persons on the elevated deck.

The green coating over the elevated deck makes it difficult to draw conclusions over the condition of the concrete, but damage below the slab (the lower level ceiling) appears to be limited to the finish except at the overhangs noted above.

The stonework below the concrete, including both the ashlar stone veneer and the brownstone band directly below the concrete, appear to be in good condition with only some minor crack repair and repointing required.

Steel lintels are rusted and should be properly prepared and repainted to ensure continued integrity.

III. Existing Conditions Analysis

B. BUILDING

The upper level Lobby, which houses the ticket booth, circulation to the locker rooms below and some office and maintenance staff, is in good condition. Programmatically the space can likely be improved to make it more functional.

The most significant concern with the upper level access and lobby is the lack of handicapped accessibility. Patrons access the lower level by means of two opposing stairways, one for boys and one for girls. The inclusion of an elevator is cost-prohibitive and not practical for a seasonal building. As such, other opportunities should be evaluated to determine if primary access for all patrons can be provided at the pool level.

III. Existing Conditions Analysis

B. BUILDING

The locker rooms at the lower level are in good condition overall, but in need of painting and updating. They are also very dated and by todays standards are large and uninviting. Even a minimal renovation to provide new color schemes, partitions and accessories, fixtures and lighting would go a long way to improve the user experience.

View looking north from the main entrance road into the Park.

III. Existing Conditions Analysis

C. RECIRCULATION, FILTRATION and CHEMICAL CONTROL SYSTEM

Water is drawn into the pool's filtration and chemical control system by means of a cast-in-place gutter at the perimeter of the pool with suction skimmers located at the bottom of the gutter channel and through three main drains located at the deep end of the pool. The pump is a 30-HP, close-coupled pump located in the lower level of the Filter Room. The system currently operates at 1100 GPM, resulting in a turnover rate of about 5.2 hours. Filtration occurs through two, 6–6" diameter high-rate sand filters operating at 16.5 GPM/sf. This flow rate results in too high a filtration rate and excess velocity in the pipes.

Filtered water is chemically treated using calcium hypochlorite fed through a Pulsar 3 feed system, located on the floor adjacent to the filters. There is no apparent means of automatically controlling pH.

Water is returned to the pool through wall inlets spaced evenly around the perimeter of the pool.

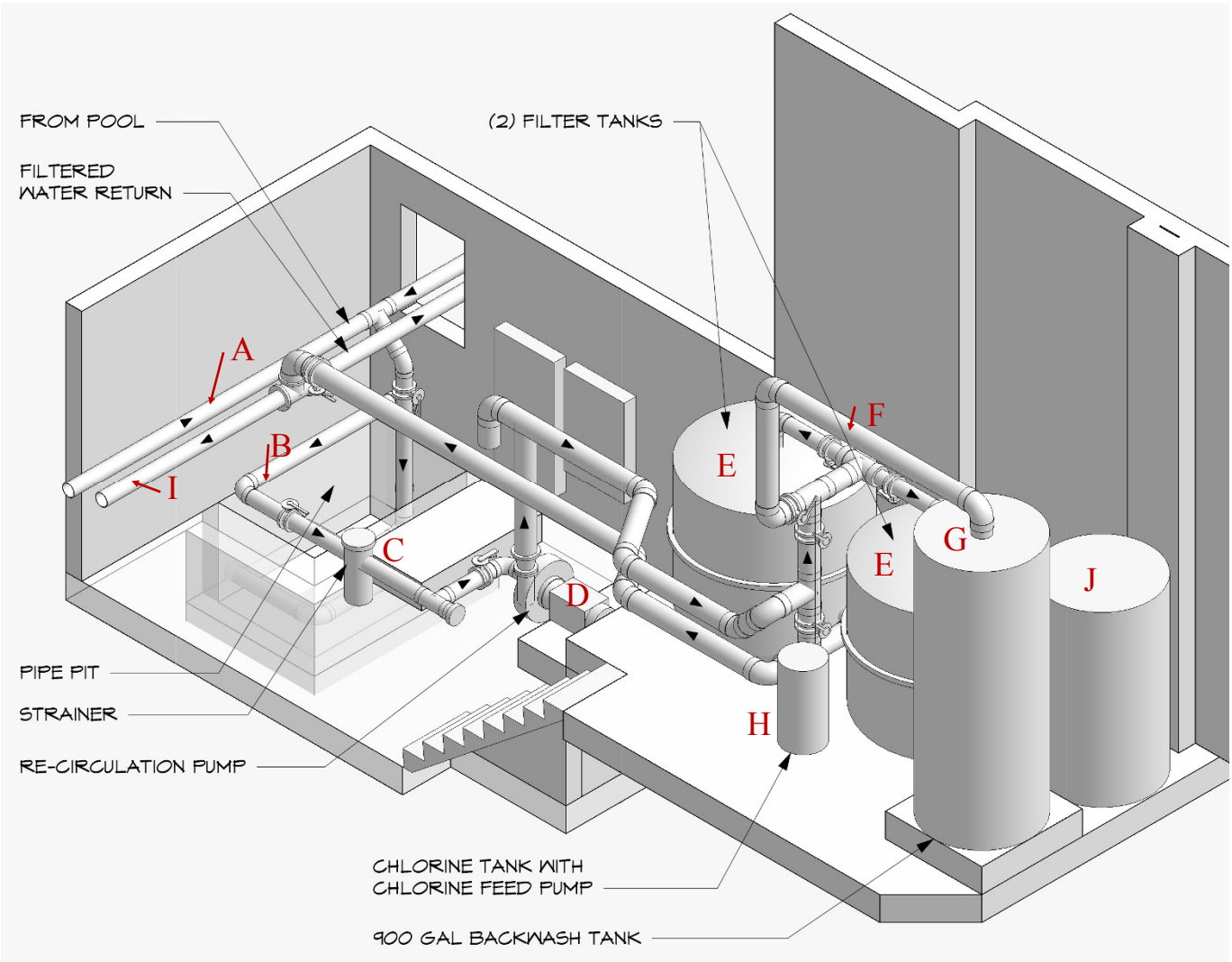
Pipes that surround the pool are accessible in a pipe pit located at the southeast corner of the Filter Room and within a pipe tunnel that surrounds the pool. The tunnel is accessed through manhole covers located on the pool deck.

Photo Above: Twin 6-foot diameter filters, joined by face piping. Also shown are influent and effluent pressure gauges at center panel and flow meter on top of gauges. At the bottom right is the Pulsar 3 hopper, which is part of the calcium hypochlorite feed system.

Backwash is by means of a single lever linkage system that opens and closes valves simultaneously. In the current arrangement, both tanks are back-washed together. Effluent runs to a 900-gallon backwash holding tank, that drains to sanitary sewer.

III. Existing Conditions Analysis

C. RECIRCULATION, FILTRATION and CHEMICAL CONTROL SYSTEM



A—Gutter Suction
B—Combined Gutter and Main Drain Suction
C—Strainer
D—Recirculation Pump
E—High-rate Sand Filter
F—Backwash Line
G—Backwash Holding Tank
H—Calcium Hypochlorite Feeder System
I—Filtered Water Return to Pool
J—Abandoned Holding Tank

III. Existing Conditions Analysis

C. RECIRCULATION, FILTRATION and CHEMICAL CONTROL SYSTEM

The systems are aging, but are well-maintained and functional. They are currently being operated outside of their DPH approved setpoint parameters. Flow rate should be reduced to 950 GPM, which will in turn bring other parameters into compliance.

Many components are in need of replacement in the short-term and a complete replacement of systems should be planned within the next three to five years.

Most bolts in the system are galvanized. Where the coating is stripped due to friction from wrenches, the bolts are rusted and will eventually fail. These should be replaced with stainless steel. Metal reducers and flanges should be prepared and painted or replaced.

Pipe supports and hangers are also deteriorated and should be repaired or replaced, as a failure would cause pipes to sag, which could strain and break pipes and fittings.

Much, but not all of the original cast-iron piping and fittings have been replaced with PVC. Remaining CI piping and fittings should be replaced to ensure longevity of the system. (See photos, next page)

III. Existing Conditions Analysis

C. RECIRCULATION, FILTRATION and CHEMICAL CONTROL SYSTEM

Photo Top: Transition of original cast-iron and replacement PVC piping at filtered water return as it goes into pipe tunnels.

Photo Left: PVC piping in tunnels, transitioning to original cast-iron fittings at gutter drains and filtered water returns.

III. Existing Conditions Analysis

D. SWIMMING POOL and DECKS

The swimming pool is a cast-in-place concrete structure. Its basic assembly consists of a mat slab, placed in multiple sections with expansion joints, onto which the pool walls were placed. The gutter is formed of concrete and provides a raised curb around the perimeter of the pool.

Pool depths range from 3-feet to 11-feet. The configuration of the diving hopper is unusual and not in compliance with any current diving standard. As a result, diving boards are removed, resulting in an underutilized area of the pool.

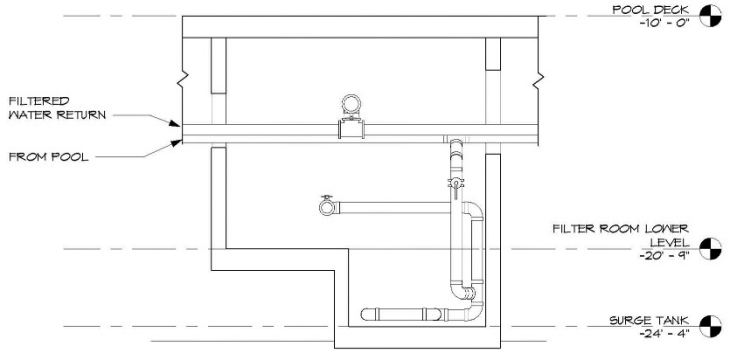
The entire pool surface was sounded using a hammer and the floor was chain-dragged, followed by a hammer in suspect areas. Concrete was found to be solid and structurally sound, with no areas identified as hollow or delaminated. Cores were taken and compressive strength tested to failure in a lab, to verify concrete strength. Chloride sampling was also performed to determine the potential for corrosion of reinforcing steel. All results were well within acceptable standards. Refer to Appendix B For the Structural Analysis and lab results.

View looking north from the pool deck.

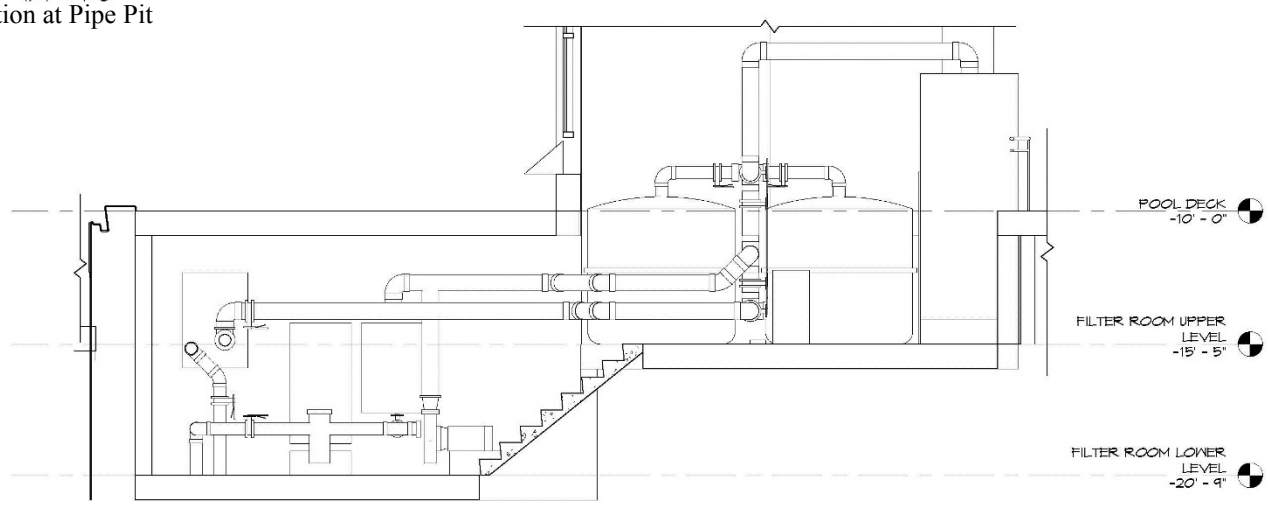
D. SWIMMING POOL and DECKS

Water leaks have been reported to be on the order of 1-3 inches per day. The City noted that water usage last season was 1,572,404 gallons. Based on some rules of thumb and taking into account an initial fill, splash out from bathers, water use from toilets, showers and sinks, we estimate the total water loss from leaks over a 3-month swim season to be approximately 12,550 gallons per day, which equals 2 1/4" of water per day. (See Appendix A for Water Loss Assumptions and Calculations).

The primary source of the leaks is likely failed expansion joints and cracks through the pool slab. It has been reported that there is often standing water in the bottom of the pipe pit that accumulates overnight. The source of this water is not known but is likely a combination of dripping fittings in the pool system finding its way to the low-point and ground water seeping into the ejector pit. The Pipe Pit floor is 14'-4" lower than the pool deck level , which places it well below the bottom of the pool. It is possible there is a leak in the main drain piping, but further testing and analysis would be required to make a judgment.



Section at Pipe Pit



Section through Filter Room

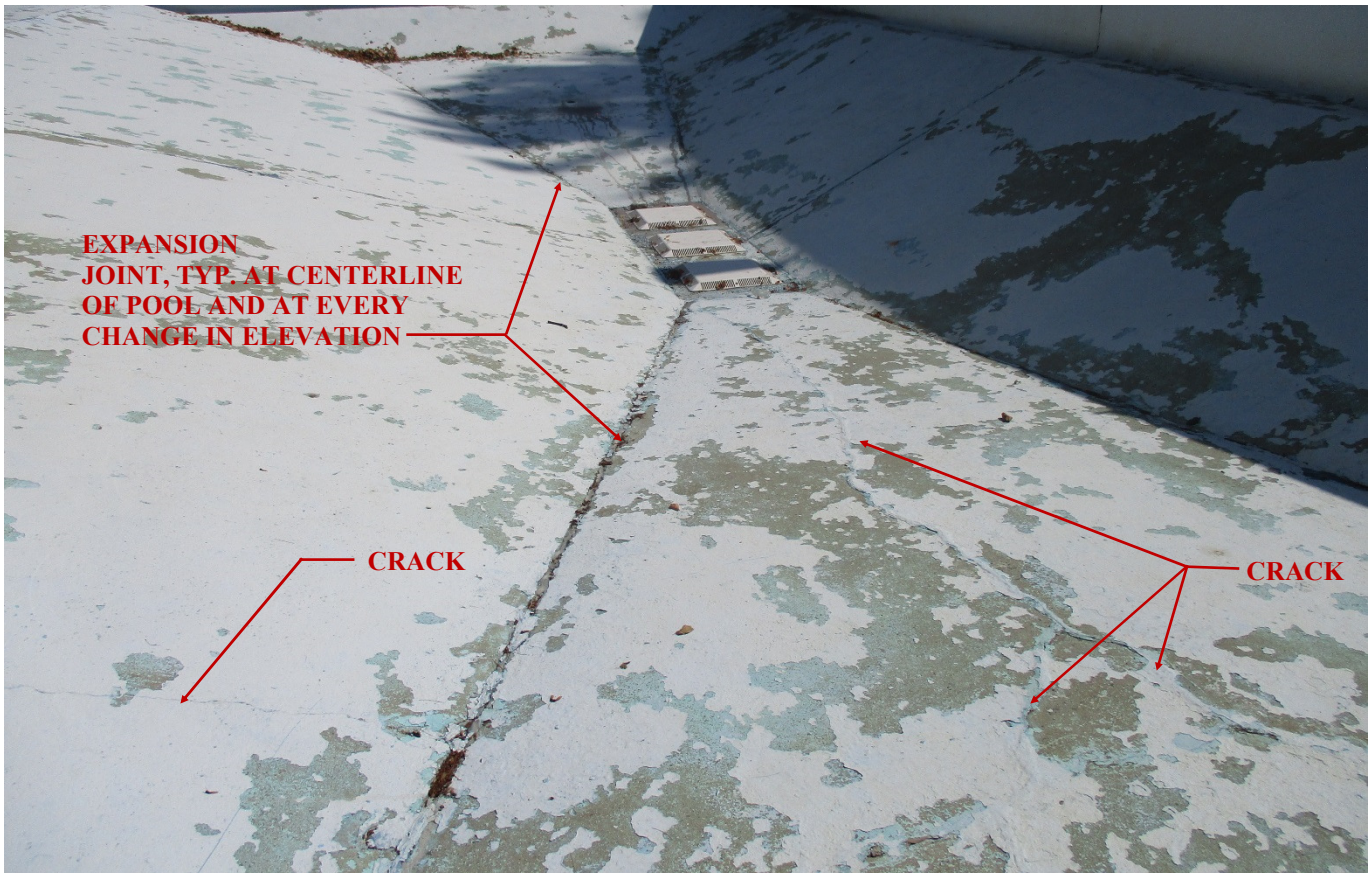
III. Existing Conditions Analysis

D. SWIMMING POOL and DECKS

There are multiple layers of paint on the pool walls and floor. The condition of the pool finish is beyond repair and requires complete removal by means of abrasive blast.

There are several cracks in the pool floor that are of significant width and length. Upon removal of paint, other cracks may become visible. All cracks require repair by injection of an appropriate crack repair material.

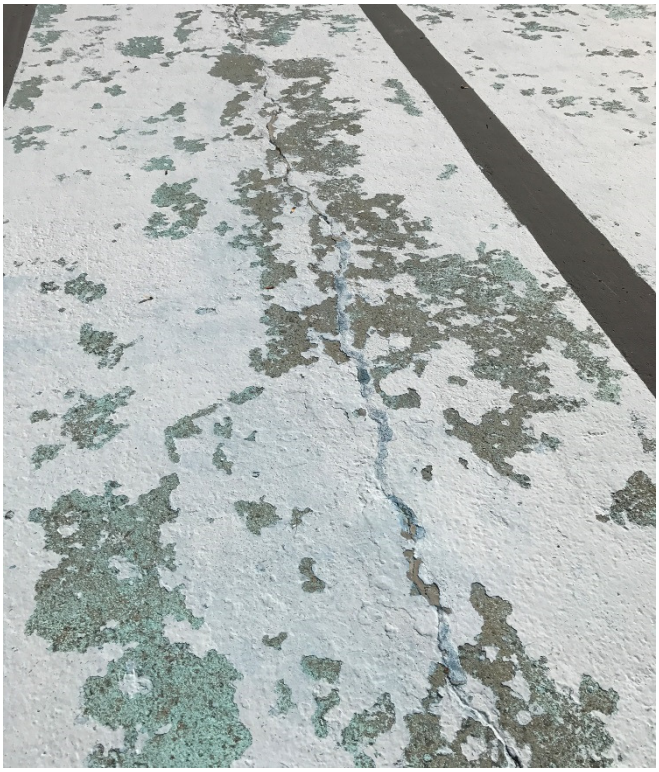
All expansion joints and sealant are in a state of failure and should be completely removed and replaced.



Above: Diving Hopper. Note failed paint finish, failed expansion joint and cracks.

III. Existing Conditions Analysis

D. SWIMMING POOL and DECKS



Above Left: Crack in pool slab, requiring crack repair.

Above Right: Expansion joints around main drain sumps and six expansion joints terminating at the deep slab. All in need of removal and replacement.

Left: Failed expansion joint at wall to floor joint.

Note failed paint at all surfaces.

III. Existing Conditions Analysis

D. SWIMMING POOL and DECKS

Pool decks consist of an elevated slab above the pipe tunnel at the full-perimeter of the pool, as well as a concrete slab-on-grade beyond the limits of the elevated slab. The elevated slab was placed on top of a metal corrugated deck. The entire deck surface is covered by a thermoplastic membrane, adhered to the slab. This metal deck below the slab and membrane on top made it impossible to evaluate the condition of the slab with regard to cracking or spalling. A core was taken through the slab at the southwest corner of the pool, within the limits of the tunnel. The results of the compressive strength indicates that the slab is sound, at least at this location.

The metal deck below the slab was used as a temporary form. It is in very poor condition and while not a structural concern, can pose a cut hazard to personnel entering the tunnel.

The tunnel is accessed by deck hatches at three locations. The condition of the slab and metal deck is in particularly poor condition at the edges of the openings. Removal of rusted metal deck and repair of concrete edges is recommended.

Photo Above: View in tunnel at west end, looking toward bathhouse. The ceiling of the tunnel is rusted and metal deck is sagging. Wall and floor surfaces appeared to be sound with no signs of structural damage.

Photo Right: Edge of opening with delaminated concrete and deteriorated steel deck.

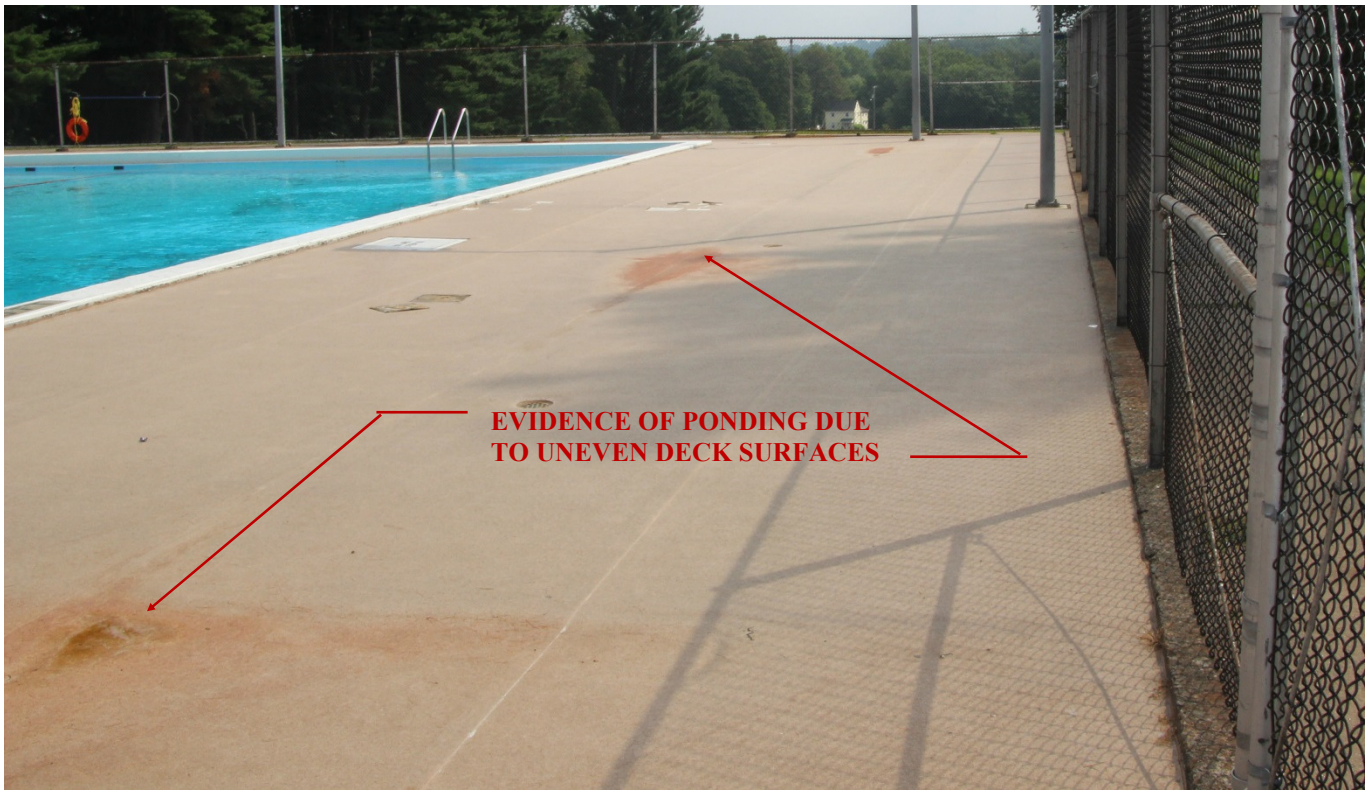
III. Existing Conditions Analysis

D. SWIMMING POOL and DECKS

The thermo-plastic membrane adhered to the concrete decking, at the time it was installed, provided a finished appearance. It is likely, however, that the decision to install it was a result of damage to the deck that was less expensive to cover than to repair or replace.

Often, the introduction of a membrane or liner results in accelerated damage to concrete, as it traps water vapor and moisture and results in damage from water infiltration, corrosion of reinforcing and freeze/thaw cycles. While we don't know the condition of this deck, we suspect it is in poor condition and any capital plan should consider complete replacement.

There are areas where the deck has sunk, as well as areas where it has lifted. These are signs of structural deficiencies and may also lead to ponding of water, which exacerbates the deterioration of the membrane and the deck.



View looking north from the pool deck.

III. Existing Conditions Analysis

D. SWIMMING POOL and DECKS

Top: Deck at south side, toward the east end has lifted about 1 1/2—2-inches.

Above: Failed sealant joint between membrane and gutter curb, allowing water to migrate under membrane.

Left: Stains due to ponding water and infiltration under the membrane.

Bottom Left: Delaminated membrane at former diving stand bases.

IV. Recommendations

IV. Recommendations

The Page Park Pool facility is capable of providing many more years of use for the community, provided a reasonable investment is made in the rehabilitation of areas of the pool, decks, building and systems. We have identified work that we recommend be completed immediately in order to provide a safe and functional facility and to avoid much more costly repairs in the coming years. We have also provided a number of options for additional improvements that will enhance the functionality for the pool, improve programming opportunities and revitalize the pool for a new generation of swimmers.

Recommendations of work to complete immediately are required for Code Compliance, Life Safety, Health Department Compliance or to repair or replace materials and equipment that are at or beyond their useful life, or in imminent risk of failure. Other options can be implemented based on the City's long-term goals, and as budget allows. It may be prudent to address longer-term options as part of the immediate actions to avoid spending dollars on items that would be removed prior to reaching the end of their life-cycle. For example, if the goal is to fill the diving hopper to provide a maximum 5-foot depth, this work should be considered now, rather than repairing cracks, replacing joints and painting the hopper, only to fill it in a few years.

A. IMMEDIATE RECOMMENDATIONS (summary):

1. Reduce flow rate to 950 GPM, resulting in a Filtration rate of 14.3 GPM/SF.
2. Install a new chemical controller and a permanent means of pH correction.
3. Replace Main Drain Covers if repairs to pool bottom cause existing drain covers to not sit flat and securely on repaired surface. Expiration date should also be verified.
4. Completely remove the existing paint by means of abrasive blast. Properly prepare the pool for repainting.
5. Repair all cracks by means of a injection with a repair material.
6. Replace all of the expansion joint materials, including complete removal of sealants and backers. It is likely that deterioration at the edges of some joints may require saw-cutting and removal of concrete in order to form proper joints.
7. Perform a maintenance program on the recirculation, filtration and chemical control systems, including replacing bolts, gaskets, hangers & supports, meters and gauges. Repair dripping or leaking fittings.
8. Make structural repairs of elevated concrete deck at the building's promenade overhang.

IV. Recommendations

A. IMMEDIATE RECOMMENDATIONS–POOL HYDRAULICS

I Size and Geometry

	Existing	Proposed
Surface Area (sf)	9,000	9,000
Volume (gallons)	342,345	342,345
Surge Tank Capacity (gallons)	N/A	N/A
Turnover Rate (minutes)	312	360

II Recirculation and Filtration Requirements

Flow Rate	1,097.26	950.96
Max. Allowable Filtration Rate	15.00	15.00
Actual Filtration Rate	16.52	14.32
Minimum SF Filter Area	73.15	63.40
Actual SF Filter Area	66.40	66.40

Current operating flow rate of 1100 GPM and a 5.2 hour turnover rate, results in a filtration rate of 16.56 GPM/SF, which exceeds the allowable rate of 15 GPM/sf. Reduce flow rate to 950 GPM (per DPH approval) and it brings filtration rate into compliance.

System Hydraulics and Piping

III Pump Suction Pipe

Pipe Diameter (inches)	8.00	8.00
Pipe Diameter (si)	50.2400	50.2400
Pipe Diameter (sf)	0.3489	0.3489
Pipe Velocity (fps)	7.0071	6.0728

1100 GPM results in pipe velocity in excess of the allowable 6 fps. 950 GPM brings the velocity into compliance.

IV Pump Discharge Pipe

Pipe Diameter (inches)	6.00	6.00
Pipe Diameter (si)	28.2600	28.2600
Pipe Diameter (sf)	0.1963	0.1963
Pipe Velocity (fps)	12.4571	10.7962

1100 GPM results in pipe velocity in excess of the allowable 12 fps. 950 GPM brings the velocity into compliance.

V Filtered Water Return Branch Pipe

Pipe Diameter (inches)	1.50	1.50
Pipe Diameter (si)	1.7663	1.7663
Pipe Diameter (sf)	0.0123	0.0123
Number of Branches	26	26
Pipe Velocity (fps)	7.6659	6.6438

IV. Recommendations

A. IMMEDIATE RECOMMENDATIONS–POOL HYDRAULICS (continued)

VI Gutter Drain (100% of Flow)

	Existing	Proposed
Pipe Diameter (inches)	2.00	2.00
Pipe Diameter (si)	3.1400	3.1400
Pipe Diameter (sf)	0.0218	0.0218
Number of Drains	26	26
Pipe Velocity (fps)	4.3121	3.7371

VII Gutter Drain (100% of Flow) Branch Pipe

Pipe Diameter (inches)	6.00	6.00
Pipe Diameter (si)	28.2600	28.2600
Pipe Diameter (sf)	0.1963	0.1963
Number of Drains	6	6
Pipe Velocity (fps)	2.0762	1.7994

VIII Main Drain (100% of Flow) Branch Pipe

Pipe Diameter (inches)	6.00	6.00
Pipe Diameter (si)	28.2600	28.2600
Pipe Diameter (sf)	0.1963	0.1963
Number of Drains	3	3
Pipe Velocity (fps)	4.1524	3.5987

IX Main Drain (100% of Flow) Main Collector Pipe

Pipe Diameter (inches)	10.00	10.00
Pipe Diameter (si)	78.5000	78.5000
Pipe Diameter (sf)	0.5451	0.5451
Number of Drains	1	1
Pipe Velocity (fps)	4.4846	3.8866

The adjustment of the Flow rate from 1100 GPM to 950 GPM will bring the pool into compliance with the CT Public Health Regulations with regard to Filtration Rate and Pipe Velocities and is consistent with the DPH Approval issued for the recirculation and filtration system installed in 1993. A copy of this approval is included in Appendix C.

IV. Recommendations

Planning options for consideration vary in terms of complexity and cost, with their benefit linked directly to these parameters. The options are summarized below and further detailed on the following pages.

B. OPTION 1 and 1A (summary):

Option 1:

1. Fill the diving hopper for maximum pool depth of 5-feet.
2. Repair, upgrade and rehabilitate the pool as described in "Immediate Recommendations".

Option 1A:

1. Fill the diving hopper to maximum pool depth of 5-feet.
2. Reduce the amount of rehabilitation to the pool and instead install a stainless steel panel system within the pool shell.
3. Repair, upgrade and rehabilitate other work as described in "Immediate Recommendations".

C. OPTION 2 and 2A (summary):

Option 2:

1. Fill the diving hopper to maximize pool depth at 5-feet deep.
2. Repair, upgrade and rehabilitate the pool as described in "Immediate Recommendations".
3. Modify the pool to provide a zero-depth ramped entry into the pool.
4. Replace recirculation, filtration and chemical control systems in their entirety.
5. Install new stainless steel perimeter gutter and surge tank.
6. Renovate the bathhouse to relocate the primary entrance to the lower level and to upgrade and modernize the bathhouse facilities. Renovate and re-purpose the upper level of the bathhouse and the promenade to provide seasonal or year-round park functions.

Option 2A:

1. Fill the diving hopper to maximize pool depth at 5-feet deep.
2. Reduce the amount of rehabilitation to the pool and instead install a "Myrtha Pool" stainless steel liner system within the pool shell.
3. Modify the pool to provide a zero-depth ramped entry into the pool.
4. Replace recirculation, filtration and chemical control systems in their entirety.
5. Renovate the bathhouse to relocate the primary entrance to the lower level and to upgrade and modernize the bathhouse facilities. Renovate and repurpose the upper level of the bathhouse and the promenade to provide year-round park functions.

IV. Recommendations

In addition to options presented above, other site improvements and amenities can be considered as part of any of the above renovation schemes.

D. ADDITIONAL IMPROVEMENTS (summary):

1. Water Slide (Photo top left)
2. Climbing Wall (Photo bottom left)
3. Aquatic Spray Features within Zero-depth Pool Area (Photo top right)
4. Shade Structures (Photo top right)
5. Expand pool fence-line to incorporate lawn areas into pool. (Photo top right)
6. Splash Pad, separate from Pool (Photo bottom right)

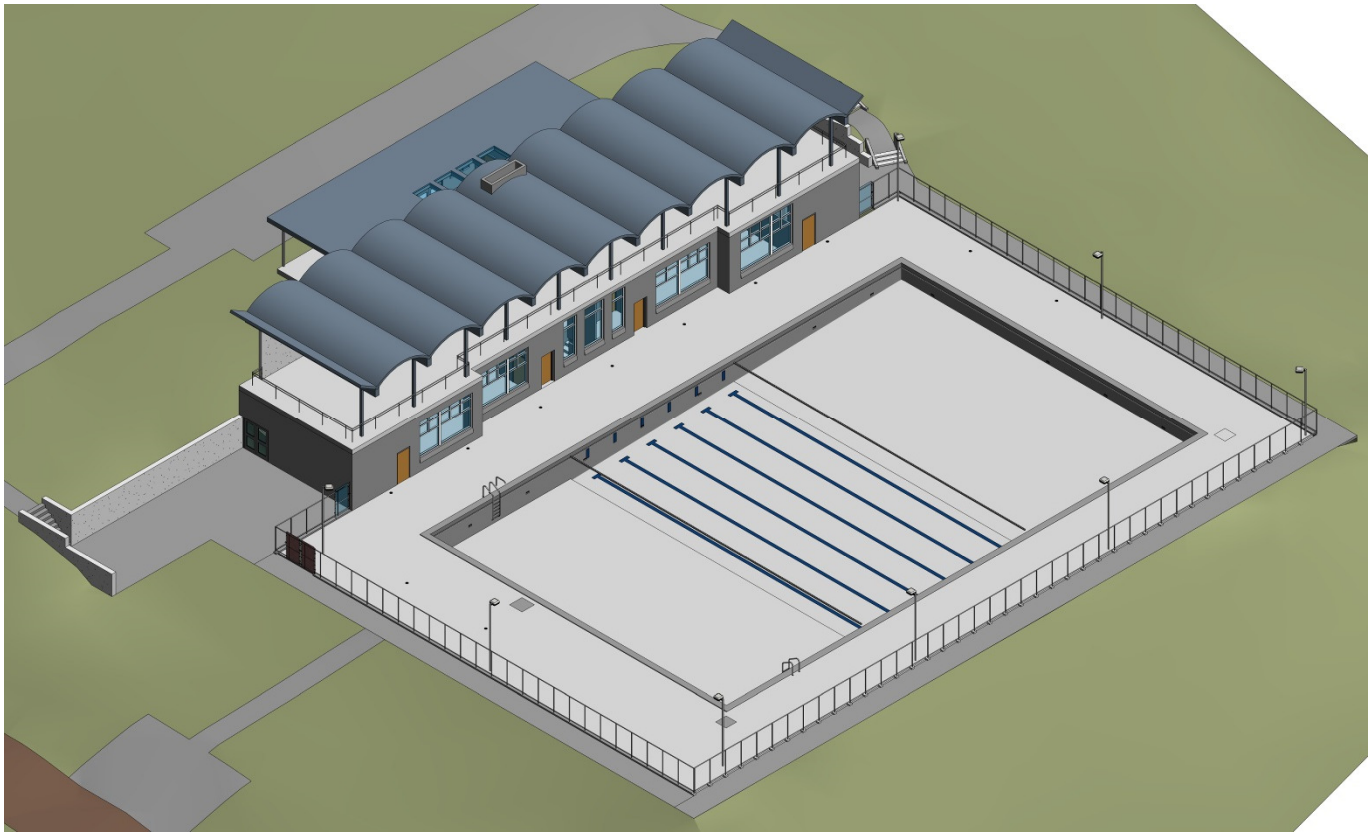
IV. Recommendations

C. OPTION 1

The primary program feature of Option 1 is to eliminate the Diving Hopper and provide a maximum depth of 5-feet at the deep end of the pool. Since the diving boards have been removed, the hopper is an underutilized part of the pool and more of a liability than an asset, both from the standpoint of safety and cost.

Reducing the depth will increase the functionality of the pool, decrease the volume of water that needs to be circulated and treated, and provides the opportunity to completely replace the main drains and main drain piping.

This option can be executed both as painted concrete (Option 1) or a stainless steel panel system (Option 1A).



IV. Recommendations

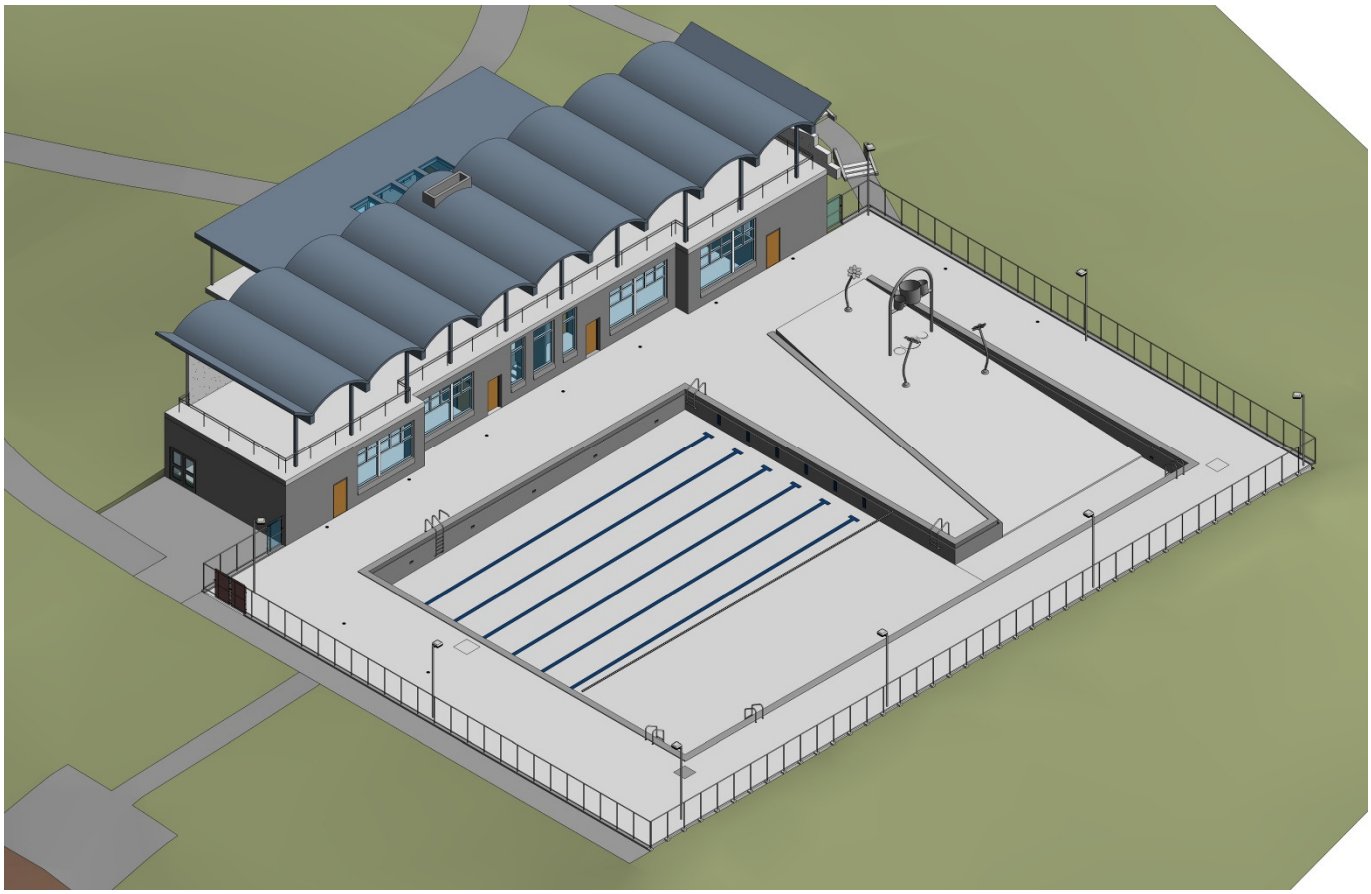
D. OPTION 2

Option 2 also suggests filling the diving hopper to a 5-foot depth, but also proposes that the pool be reconfigured to provide zero-depth access, significantly expanding programming options for small children, the elderly and the disabled.

Lap lanes would be turned 90-degrees from their current orientation and the shallow area would be separated form the lap pool by a new peninsula, allowing for multiple activities to occur in the pool simultaneously.

Spray features can be added to the zero-depth area to enhance the facility's recreational appeal.

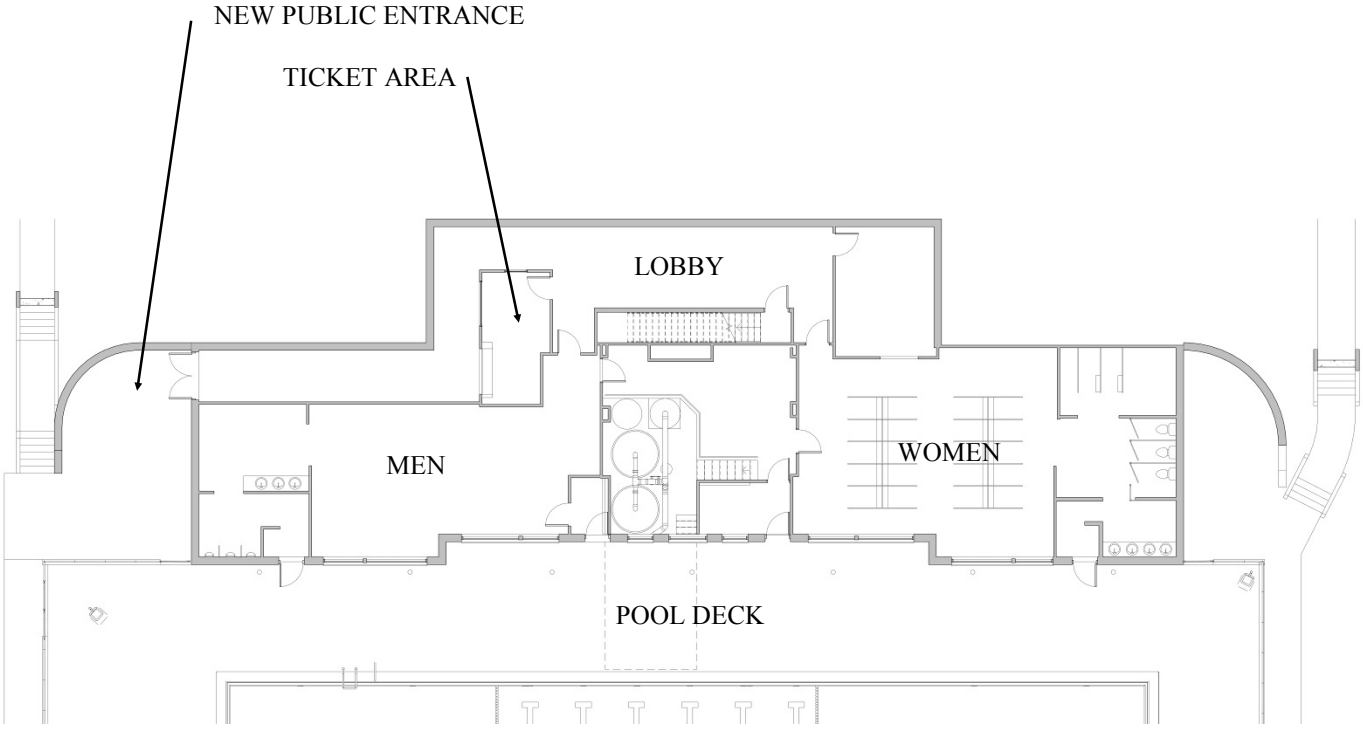
This option can be executed in painted concrete (Option 2) or stainless steel panel system (Option 2A).



D. OPTION 2

In addition to pool renovations, Option 2 proposes a significant renovation to the bathhouse to provide primary access at the lower level so that all patrons follow the same path to the pool. The lower lot, where HCA parking is currently available, would remain but be improved. Access from the upper lot would be by new handicapped accessible pathways leading to both levels of the building.

The upper level could be repurposed for a number of park-related activities, seasonally or on a year-round basis. All pool activities would occur at the lower-level with direct access to the pool deck.



Appendix A
Leak Calculations

Page Park Pool - Bristol, CT
February 2018

Item	
Pool Volume	342,345 Gallons
Pool Surface Area:	9,000 SF
Water Use (over 3 months)	1,572,404 Gallons
Evaporation (average/day)	1/8"
Backwash:	1000GPM/4 min. every 2 weeks
Swim Season	90 Days
Bather Load Factors:	
Daily Showers:	400
Daily Flushes:	400
Daily Handwash:	400
Dips in Pool:	1200
Water Use Factors (Gallons):	
Initial Fill:	345,000
Use for Showers (4.2 Gallons/Shower):	1680
Use for Flush (3 Gallons/Flush):	1200
Use for Handwash (1/2 Gallons/Wash):	200
Loss per Plunge (Drip-out) of 1/2 Gallon per Dip:	600
Evaporation:	63,300
Filter Backwash:	31,000
NetWater Use (accounted for):	**442,980**
Gross Water Used:	1,572,404
Net Calculated Leakage per Season:	**-1,129,424**
Water Loss per Day (Gallons):	-12549.16
Water Loss per day (Inches):	-2.25

Notes:

1 Rainwater added to the system is not included in these calculations. As such, actual water loss due to leakage may be higher.
2 Caluclations are based on 400 Swimmers / per day, with each entering and exiting the pool three times during their visit.

Appendix B

Structural Analysis

GNCB
Consulting Engineers, P.C.

Field Report:1

Sent Via: Email

Date: October 24, 2017
Attention: Michael Fortuna
Project: Page Park Pool
Job Number: 17139
Present: Richard Centola, Michael Fortuna

On September 25th, GNCB (Richard Centola) and TLBA (Michael Fortuna) visited the site to observe the condition of the pools and surrounding concrete deck at this facility.

All pools walls were sounded with hammers on approximately a one foot grid and the slab was chain dragged with any audible anomalies followed up with hammer testing. In general the concrete appeared in good condition with no hollow sounding areas, spaulling, or other visible signs of corrosion or deterioration of the concrete or reinforcement.

Independent Materials Testing Laboratories, Inc. (IMTL) was brought to the site to take concrete samples from the pool slab and walls for chloride ion testing as well as core samples for strength testing. A core sample was also taken from the pool deck slab.

Pool core samples were taken in the north and south walls (shallow and deep end walls), and in the slab in both shallow and deep ends. Two chloride ion samples were taken adjacent to each slab core. The samples were taken from concrete 0-1/2” deep and 1/2”-1’ deep at each location. The deck core sample was taken near the north west corner of the pool.

Chloride ion testing involved drilling into the concrete and collecting the dust for lab testing. The sample dust was limited to 1” deep as this represents the region of concrete in closest proximity to the chlorinated water and that provides protection for the reinforcing steel.

For the core samples, IMTL used surface penetrating radar equipment to find and mark the locations of the rebar so that slab cores would not cut through the reinforcement, then used a core drill to cut the sample. The location of the core sample from the pool deck was dictated by the location of a seam in the covering material and rebar was encountered.

The core samples were broken off prior to going completely through the walls/slabs so total thickness was not determined. Visual observation of the concrete cores indicated sound concrete.

Principals
Kenneth Gibble, P.E.
James F. Norden, P.E.
Charles C. Brown, P.E.

Geotechnical Associate
David L. Freed, P.E.

Structural Associate
Richard A. Centola, P.E.

130 Elm Street
P.O. Box 802
Old Saybrook, CT 06475
Tel 860.388.1224
Fax 860.388.4613
lastname@gncbengineers.com
gncbengineers.com

GNCB
Consulting Engineers, P.C.

The compressive strength test results varied from just under 5800psi up to just over 9000psi. For new pool construction we would typically specify concrete in the 3000-4000psi range therefore even the lowest strength sample tested is of acceptable strength.

The American Concrete Institute (ACI) sets the maximum permitted level of water-soluble chloride ions in new concrete that will be exposed to chloride in service at 0.150% by weight relative to the weight of cement in the concrete.

This is a much lower value than other concrete as it is expected that the chloride content will increase over time. The concrete samples all fell between 0.010% and 0.027%. These values represent the average chloride ion content within the first one inch of concrete and are well below the permitted values for new concrete. It should be expected that the concentration at the surface would be higher and at a depth of 1” the level would be lower.

Looking at all of the data, and the lack of visual evidence of rebar corrosion, with continued maintenance at current levels, the pool should continue perform as intended.

The general condition of the pool deck slab could not be determined as the entire surface is covered with a synthetic adhered surface. The steel form deck under the south end of pipe tunnel has completely deteriorated however this deck is usually only intended to support the weight of the concrete until it cures and not to provide continued structural support. The concrete around the access hatches has some significant local deterioration that should be repaired.

Submitted by: Richard Centola, P.E.

Copies to: **Sent via:**

IMTL

Accurate information you can rely on.

Surface Penetrating Radar (SPR) & Coring Inspection Report

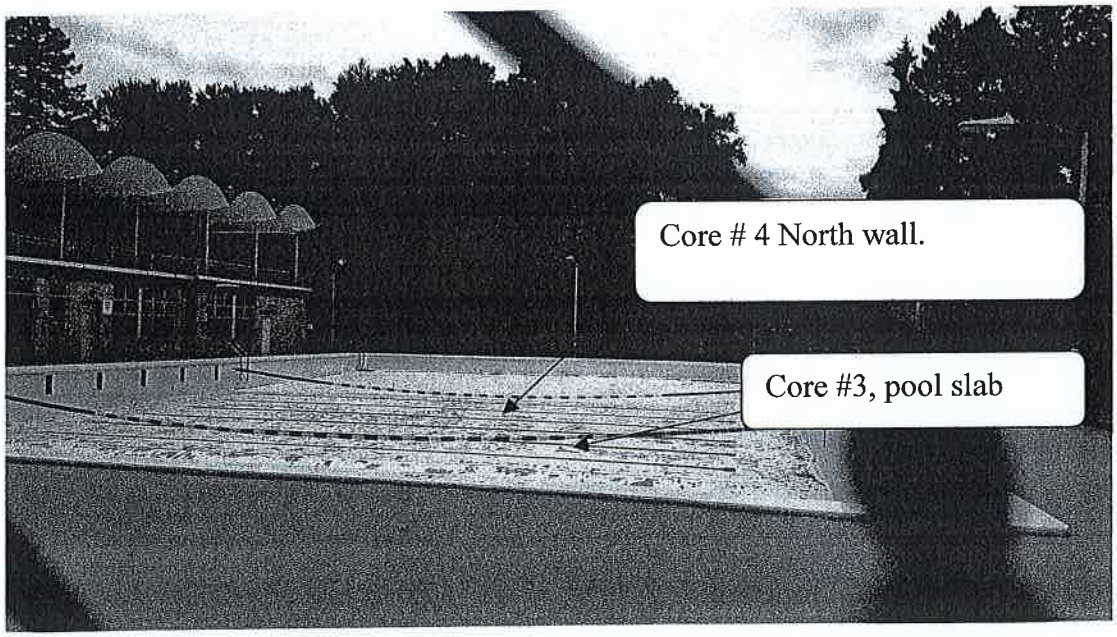
Client:	GNCB Consulting Engineers	Project No.:	3488
Project:	Page Park Pool – Bristol, CT	Report No.:	001
Inspector:	Shawn Roberts / Greg Aiudi	Date:	9/25/17
Subject:	SPR and Concrete Coring	Page:	1 of 3

STATE OF CONNECTICUT RICHARD WHITE NO. 10056 REGISTERED PROFESSIONAL ENGINEER

This firm was scheduled by our Client to:

- Extract concrete cores from the sides and slab of the existing swimming pool.
- Extract a core from the pool deck over the tunnel.
- Sample one (1) concrete side wall and one (1) concrete slab location for chloride testing.

In order to avoid cutting through the rebar in the pool walls and slab, IMTL was asked to scan the concrete with ground penetrating rebar. Each of the four (4) pool locations were selected by GNCB Engineers.



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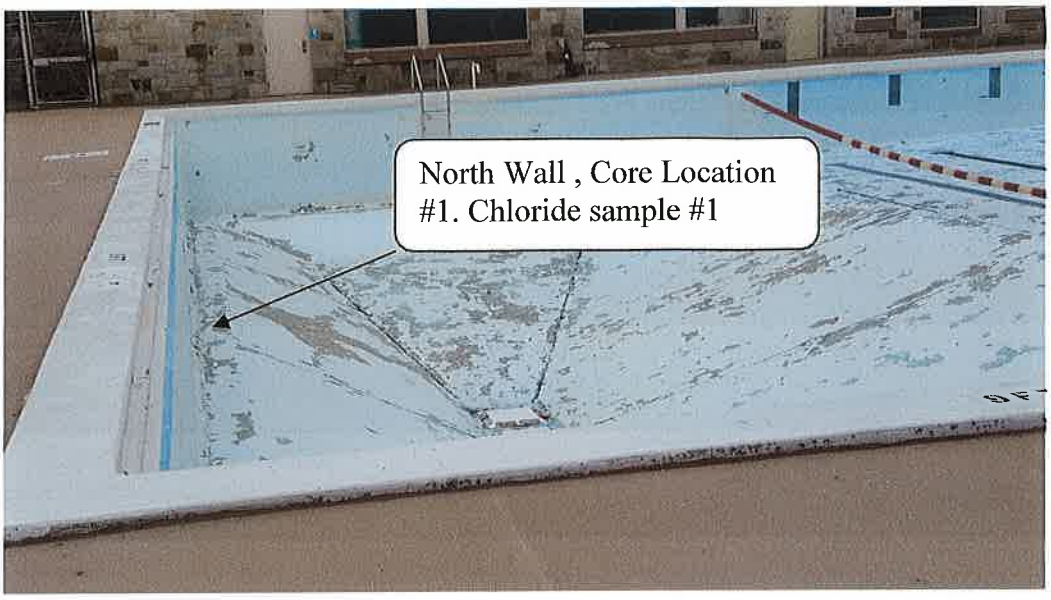
North Wall , Core Location
#1. Chloride sample #1

Core # 2, Pool slab &
chloride sample

All samples were transported back to the lab for processing

pc: Richard Centola, GNCB Consulting Engineers / Michael Fortuna, TLB Architecture, LLC
km

Concrete Coring Report

IMTL
Accurate information you can rely on.

Client:	GNCB Consulting Engineers	Project No.:	3488
Project:	Page Park Pool – Bristol, CT	Report No.:	002
Date Concrete Placed:	1970's	Report Date:	10/16/17
Date Core Obtained:	09/25/17	Lab Time / Date Placed in Sealed Bags:	09/26/17 12:15 pm
Cored by Whom:	Unknown		
Field / Lab Technician:	Shawn Roberts Jason Norton	Date Cores Tested: Time Cores Tested:	10/02/17 7:30 am
Date of Capping:	09/30/17	Age of Concrete at Testing:	Unknown

Lab No	Length as Drilled	Time Drilled/ Placed in Bag	Sawed Length (in)	Capped Length (in)	Dia. (in)	Wt. (lbs)	Density (lbs / ft^3)	Area, Sq. Inches	Failure Load (lbs)	Comp. Strength (psi)	Corrected Strength (psi)
318096	8.00	9:15 am	7.50	7.70	3.88	7.76	151.2	11.82	73320	6200	
318097	5.75		5.40	5.65	3.89	5.72	154.0	11.88	113380	9540	9100
318098	6.25		6.45	6.70	3.89	6.71	151.3	11.88	85780	7220	7060
318099	7.25		6.75	6.95	3.90	6.81	145.9	11.94	77350	6480	
318100	3.50		3.50	3.75	2.90	2.06	154.0	6.61	41130	6220	5820

Nominal Maximum Aggregate Size: 3/4" Load applied to horizontal plane of concrete as placed

Unless Stated Otherwise: 1. Cores tested in accordance with ASTM C-42. 2. Cores fractured normally. 3. Cores were free of obvious defects. **4. If core dia. less than 3.7" state reason:** Core No. 5, Lab No. 318100 had rebar present in it.

Test Method Exceptions:

Cores	Correction Factors Used	Location of Cores
318097	1.45/.954	
318098	1.75/.978	
318100	1.29/.935	

pc: Richard Centola, GNCB Consulting Engineers / Michael Fortuna, TLB Architecture, LLC
jv

Independent Materials Testing Laboratories, Inc.
57 N. Washington St., P.O. Box 745, Plainville, CT 06062
T 860.747.1000 F 860.747.6455
mail@imtlct.com www.imtlct.com

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IMTL

Accurate information you can rely on.

Concrete Coring Report

Client:	GNCB Consulting Engineers	Project No.:	3488
Project:	Page Park Pool – Bristol, CT	Report No.:	002
Date Concrete Placed:	1970's	Report Date: Revision:	10/16/17 10/17/17
Date Core Obtained: Cored by Whom:	09/25/17 Unknown	Lab Time / Date Placed in Sealed Bags:	09/26/17 12:15 pm
Field / Lab Technician:	Shawn Roberts Jason Norton	Date Cores Tested: Time Cores Tested:	10/02/17 7:30 am
Date of Capping:	09/30/17	Age of Concrete at Testing:	Unknown

Lab No	Length as Drilled	Time Drilled/ Placed in Bag	Sawed Length (in)	Capped Length (in)	Dia. (in)	Wt. (lbs)	Density (lbs / ft^3)	Area, Sq. Inches	Failure Load (lbs)	Comp. Strength (psi)	Corrected Strength (psi)
318096	8.00	9:15 am	7.50	7.70	3.88	7.76	151.2	11.82	73320	6200	
318097	5.75	9:30 am	5.40	5.65	3.89	5.72	154.0	11.88	113380	9540	9100
318098	6.25	10:00 am	6.45	6.70	3.89	6.71	151.3	11.88	85780	7220	7060
318099	7.25	10:30 am	6.75	6.95	3.90	6.81	145.9	11.94	77350	6480	
318100	3.50	10:45 am	3.50	3.75	2.90	2.06	154.0	6.61	41130	6220	5820

Nominal Maximum Aggregate Size: 3/4" Load applied to horizontal plane of concrete as placed

Unless Stated Otherwise: 1. Cores tested in accordance with ASTM C-42. 2. Cores fractured normally.
3. Cores were free of obvious defects. **4. If core dia. less than 3.7" state reason:** Core No. 5, Lab No. 318100 had rebar present in it.

Test Method Exceptions:

Cores	Correction Factors Used	Location of Cores
318097	1.45/.954	See Report No. 001
318098	1.75/.978	
318100	1.29/.935	

Revision: Added times in above chart.

STATE OF CONNECTICUT RICHARD WHITE REGISTERED PROFESSIONAL ENGINEER

Independent Materials Testing Laboratories, Inc. T 860.747.1000 mail@imtlct.com
57 N. Washington St. PO Box 745 Plainville, CT 06062 F 860.747.6455 www.imtlct.com

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pc: Richard Centola, GNCB Consulting Engineers / Michael Fortuna, TLB Architecture, LLC
jv

IMTL

Accurate information you can rely on.

Water Soluble Chloride Ion Report

Client:	GNCB Consulting Engineers	Project No.:	3488
Project:	Page Park Pool – Bristol, CT	Report No.:	003
Project Manager:	David P. Aiudi	Date:	10/19/17
Subject:	Water Soluble Chloride Ion	Page:	1 of 3

Four (4) concrete samples were collected and sent to American Engineering Testing, Inc. for Water Soluble Chloride Ion testing. The results can be found attached.

STATE OF CONNECTICUT
RICHARD W. H
10-27-17
No. 10036
REGISTERED
PROFESSIONAL ENGINEER

pc: Richard Centola, GNCB Consulting Engineers / Michael Fortuna, TLB Architecture, LLC
km

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AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
· ENVIRONMENTAL
· GEOTECHNICAL
· MATERIALS
· FORENSICS

REPORT OF: CONCRETE ANALYSIS

PROJECT: PAGE PARK POOL
BRISTOL, CT.

Date: October 9, 2017

REPORTED TO: INDEPENDENT MATERIALS TESTING LABORATORIES, INC
ATTN: DAVID AIUDI
57 NORTH WASHINGTON STREET
P.O. BOX 745
PLAINVILLE, CT 06062

CC: imtladmin@imtlct.com
daiudi@imtlct.com

LABORATORY NO: 40-00065
Date Received: 10/02/17
Date Sampled: ---

ANALYTICAL RESULTS

Parameter	Lab # 8807 1A Walls 17-4242	Lab # 8808 1B Walls 17-4243	Lab # 8810 2B Slab 17-4244	Method*	Date Analyzed
Water Soluble Chloride in Concrete, %	0.0031	0.0037	0.0022	ASTM C1218	10/05/17
Water Soluble Chloride in Cement, % (21% cement)	0.015	0.018	0.010	Calculated	10/05/17

* The samples were analyzed according to methods referenced in ASTM C1218 "Standard Test Method for Water Soluble Chloride in Mortar and Concrete." This method is based on the potentiometric titration of chloride with silver nitrate.

LABORATORY QUALITY CONTROL

		ACCURACY DATA		PRECISION DATA
Parameter	Sample #	Matrix Spike Percent Recovery	Matrix Spike Duplicate Percent Recovery	Relative Percent Difference
Chloride	17-4025	100%	95%	6.7%

American Engineering Testing, Inc.

Virginia VerMulm
QA Manager

Dan T. Hanson
Chemistry Manager

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AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
· ENVIRONMENTAL
· GEOTECHNICAL
· MATERIALS
· FORENSICS

REPORT OF: CONCRETE ANALYSIS

PROJECT: PAGE PARK POOL
BRISTOL, CT.

Date: October 19, 2017

REPORTED TO: INDEPENDENT MATERIALS TESTING LABORATORIES, INC
ATTN: DAVID AIUDI
57 NORTH WASHINGTON STREET
P.O. BOX 745
PLAINVILLE, CT 06062

CC: imtladmin@imtlct.com
daiudi@imtlct.com

LABORATORY NO: 40-00065
Date Received: 10/13/17
Date Sampled: ---

ANALYTICAL RESULTS

Parameter	2A, SLAB 17-4422	Method*	Date Analyzed
Water Soluble Chloride in Concrete, %	0.0056	ASTM C1218	10/19/17
Water Soluble Chloride in Cement, % (21% cement)	0.027	Calculated	10/19/17

* The samples were analyzed according to methods referenced in ASTM C1218 "Standard Test Method for Water Soluble Chloride in Mortar and Concrete." This method is based on the potentiometric titration of chloride with silver nitrate.

LABORATORY QUALITY CONTROL

		ACCURACY DATA		PRECISION DATA
Parameter	Sample #	Matrix Spike Percent Recovery	Matrix Spike Duplicate Percent Recovery	Relative Percent Difference
Chloride	17-4422	99%	97%	1.6%

American Engineering Testing, Inc.

Virginia VerMulm
QA Manager

Dan T. Hanson
Chemistry Manager

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AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
· ENVIRONMENTAL
· GEOTECHNICAL
· MATERIALS
· FORENSICS

REPORT OF: CONCRETE ANALYSIS

PROJECT: PAGE PARK POOL
BRISTOL, CT.

Date: October 9, 2017

REPORTED TO: INDEPENDENT MATERIALS TESTING LABORATORIES, INC
ATTN: DAVID AIUDI
57 NORTH WASHINGTON STREET
P.O. BOX 745
PLAINVILLE, CT 06062

CC: imtladmin@imtlct.com
daiudi@imtlct.com

LABORATORY NO: 40-00065
Date Received: 10/02/17
Date Sampled: ---

ANALYTICAL RESULTS

Parameter	Lab # 8807 1A Walls 17-4242	Lab # 8808 1B Walls 17-4243	Lab # 8810 2B Slab 17-4244	Method*	Date Analyzed
Water Soluble Chloride in Concrete, %	0.0031	0.0037	0.0022	ASTM C1218	10/05/17
Water Soluble Chloride in Cement, % (21% cement)	0.015	0.018	0.010	Calculated	10/05/17

* The samples were analyzed according to methods referenced in ASTM C1218 "Standard Test Method for Water Soluble Chloride in Mortar and Concrete." This method is based on the potentiometric titration of chloride with silver nitrate.

LABORATORY QUALITY CONTROL

		ACCURACY DATA		PRECISION DATA
Parameter	Sample #	Matrix Spike Percent Recovery	Matrix Spike Duplicate Percent Recovery	Relative Percent Difference
Chloride	17-4025	100%	95%	6.7%

American Engineering Testing, Inc.

Virginia VerMulm
QA Manager

Dan T. Hanson
Chemistry Manager

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Appendix C

Stainless Steel Panel System Information

Myrtha Pools USA Inc.
1800 2nd St., Suite 758
Sarasota, Florida 34236
Tel: (941) 955-2591 Fax. (941) 955-0862

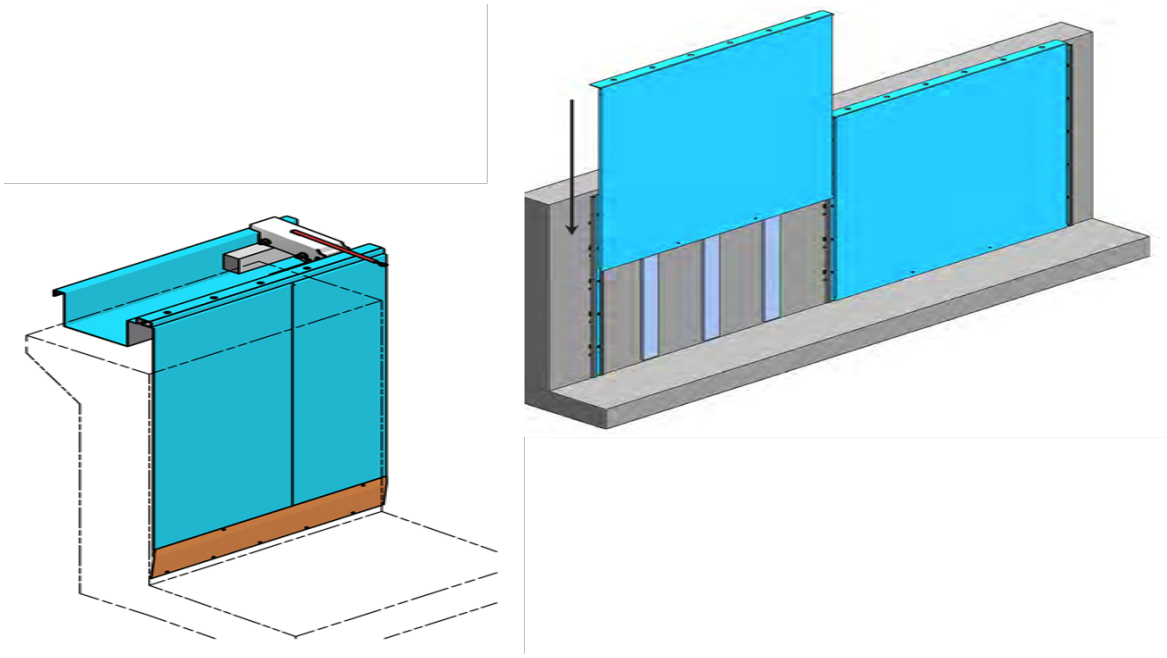
Myrtha RenovAction Technical Memorandum

To: TLBA & City of Bristol
From: Myrtha Pools USA, Inc. (Director of Technical Services - John E. Ireland, PE)
Date: December, 2017
Re: Myrtha Pools Proposal for the Renovation of the Page Park Pool, Bristol, CT

To Whom It May Concern:

Myrtha Pools would like to present the following option to perform a true RenovAction® renovation to the Page Park Pool with the outcome of an outstanding recreational swimming facility which will eliminate the reoccurring issues presently impacting the pool and its users.

The Myrtha technology is based on modular stainless steel panels hot calendared with rigid PVC sheets and fiberglass reinforced composite membranes. The patented finished product blends the attributes of both materials to create a shell that is simultaneously very strong, yet flexible under stress. The custom Myrtha technology, by nature, is able to maintain its structural integrity and water tightness under conditions that would crack conventionally constructed pools to pieces. Our proprietary technologies, proven experience in the competitive swimming world, and speed of a modular installation sets us apart and also makes us uniquely suited for major pool renovations like the proposed upgrades for the Page Park Pool.



As mentioned, we propose Myrtha's patented and exclusive RenovAction® technology, specifically developed for the refurbishment of existing pools. RenovAction® uses the same Myrtha materials as a brand-new installation and comes with the same industry leading warranty (25-years structure / 10-years waterproofing) backed by a company with a 53-year history and endorsed by every major swimming organization in the world, including USA Swimming and FINA. Myrtha Pools are synonymous with the Olympics and the highest level of competition, but we bring the same precision and durability to all of our clients. The Myrtha solution also allows for minimal demo and prep work prior to installation. The existing concrete can spall, fiberglass splinter and tile delaminate behind the steel without affecting the structural integrity or waterproofing.

The anticipated life span (with independently documented significant lower cost of ownership) of a Myrtha Pool is unknown as we have never replaced one, but we expect the PVC components to last a minimum of 25 years in an outdoor installation. When replacement is desired, we can relaminate the steel panels in the field using essentially the same original factory process and the owner is left with a brand-new pool with a brand-new warranty. No one else, and I do mean no one, can make such a commitment. Myrtha Pools also have upwards of a 50% reduction in carbon footprint to conventionally constructed pools and can be ordered with varying degrees of post-consumer recycled content.

With over 20,000 commercial installations in 82 countries, the bottom line is that the Myrtha system has the flexibility and experience in a variety of different challenging conditions to complete the task being proposed. We design every aspect of our technology and continually innovate to make our pools the most functional and dependable system available on the competitive and recreational market. There is no better choice than to purchase a Myrtha pool.

We sincerely look forward to the opportunity to assist you with this project. For your reference, please see below completed installations similar to your project.

Should you have any questions related to these remarks, we may be reached by telephone at 941-350-3286 / 214-773-1243 or email at jireland@myrthapoolsusa.com / jcleveland@myrthapoolsusa.com. Thank you very much for your consideration.

Sincerely,

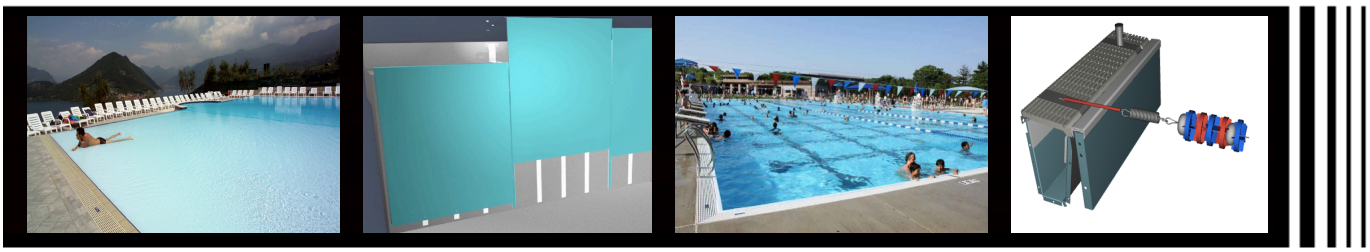
John E. Ireland, PE, LEED AP
Director of Technical Services

Jon Cleveland
Regional Sales Manager

Budget Highlights	Anticipated Costs	Optional Extras (Costs TBD)
• SS Gutter and Panel System • Fiberglass Reinforced PVC Membrane • Factory Installation • Industry Leading Warranty	Myrtha RenovAction Installed • Scheme A&B: **$547,650.00 USD** • Scheme C: **$676,050.00 USD** See Attached Material & Scope Breakdown	• Proprietary Soft Floor System • Proprietary Comp Inlets • Olympic Standard Acc. • Efficient Mechanical Systems

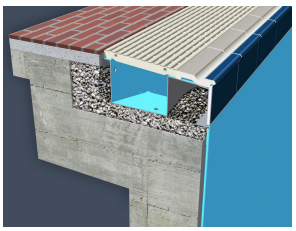
Myrtha Pools USA Inc.
1800 2nd St., Suite 758
Sarasota, Florida 34236
Tel: (941) 955-2591 Fax. (941) 955-0862

Date: 12-06-2017
Quote#: 120617-2



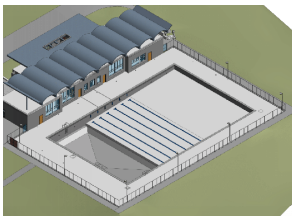
Myrtha Materials Budget Opinion

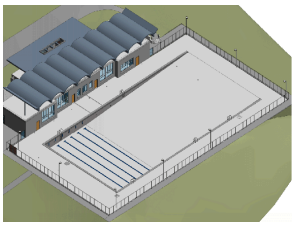
PROJECT: PAGE PARK POOL, BRISTOL, CT
CLIENT: CITY OF BRISTOL, CT
REFERENCE: TLBA SD/CONCEPTS 11/2017
POOL (SCHEME A&B): MUNICIPAL/RECREATION
DIMENSIONS: 124FT X 79FT
P=406 LF SF=9,796



MYRTHA MATERIALS:

- 406 LF Myrtha RenovAction Panels w/Rail System @ 1ft-5ft Depth
- 406 LF Myrtha RenovAction Classic Rim Flow Gutter & Grating
- 9,796 SF Myrtha Membrane for Flooring
- 75 Myrtha PVC Floor Inlets
- 3 Myrtha Main Drains (18”x36”)
- 6 Myrtha PVC Paint Lane Lines
- 12 Myrtha PVC Paint Targets
- 14 Myrtha Low Profile Lane Rope Anchors
- Installation of Myrtha Components Only



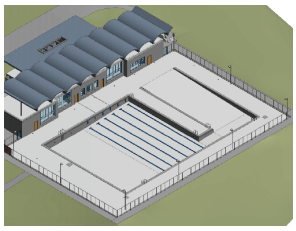


TOTAL: $547,650.00 USD NET

POOL (SCHEME C): **MUNICIPAL/RECREATION**
DIMENSIONS: **124FT X 79FT**
P=406 LF SF=9,796

MYRTHA MATERIALS:

- 396 LF Myrtha RenovAction Panels w/Rail System @ 1ft-5ft Depth
- 150 LF Myrtha Classic Panel w/Buttress System @ 4ft Depth
- 546 LF Myrtha RenovAction Classic Rim Flow Gutter & Grating
- 9,096 SF Myrtha Membrane for Flooring
- 75 Myrtha PVC Floor Inlets
- 3 Myrtha Main Drains (18”x36”)
- 6 Myrtha PVC Paint Lane Lines
- 12 Myrtha PVC Paint Targets
- 14 Myrtha Low Profile Lane Rope Anchors
- Installation of Myrtha Components Only



TOTAL: $676,050.00 USD NET

EXCLUSIONS:

- Installation of Non-Myrtha Components
- Demolition of Existing Structure
- Mechanical Systems
- Plumbing & Electrical
- SS Ladders/Handrails for Entries & Steps
- Concrete/Footers/Structural Foam/Depth Reconfiguration
- Underwater Lights and Niches

Myrtha Pools Conditions

1 DDP (Delivery duty paid) site – A&T Europe S.p.A. pays freight, duty, insurance and brokerage.
2 Delivery – 120 days from written approval of our drawings, unless agreed in writing elsewhere by A&T Europe S.p.A. / Myrtha Pools.
3 All purchase orders and payments must be issued to A&T Europe S.p.A., Via Solferino, 27 – 46043 Castiglione d/Stiviere (MN).
4 Payment Terms: 20% deposit is required prior to the start of design drawings. The balance is to be paid prior to shipment either through a bank wire transfer, or by a Letter of Credit issued by a US bank. Budget prices are valid for 90 days after quotation.
5 No Final Formal Quote until there is a Final Bid set drawings.
6 All taxes extra – some taxes may be payable by customer prior to customs release.
7 Civil works, site works, excavation & hauling, concrete works, sealing, backfill, deck construction, coping, electrical works, grounding works, mechanical works and commissioning works are not included in this price. **Installation of Myrtha components ONLY is estimated in this budget.**
8 Dewatering, if necessary, is the responsibility of others, not A&T Europe / Myrtha Pools.
9 Concrete footings and floor must have a helicopter or trowel finish, (smooth and glossy as detailed in our Myrtha installation manual and guide.). Finish not meeting the Myrtha Pools standards, will be at the cost of others.
10 Drawings are to be transmitted electronically. Price includes up to one revision.
11 Items not specifically included in the referenced quotation are not included in the Net Sell Price.
12 A&T Europe S.p.A. / Myrtha Pools reserves the right to make changes to the pool component design at their discretion.
13 Installation of the Myrtha Pool components must be carried out by an authorized Myrtha installer or supervised by an authorized factory supervisor. Authorization of installers and supervisors is at the sole discretion of A&T Europe S.p.A. / Myrtha Pools. Installation by unauthorized technicians or against our recommendations will void or jeopardize the Myrtha guarantee and warranty obligations.
14 All fittings or accessories installed within the Myrtha Pool must be provided by A&T Europe or, where this is not practicable, must be approved for installation in writing by A&T Europe S.p.A. / Myrtha Pools. Lack of such approval will jeopardize the Myrtha guarantee and warranty obligations.
15 Shipping containers when delivered, must be unloaded immediately and not left on site. Other arrangements may be made directly with the freight forwarding company at the distributors expense. A&T Europe will not have any liability or expense.

Notes

For Myrtha factory supervisor, add $650.00 USD per day, including travel days, plus room and board. A&T Europe / Myrtha Pools require 3-weeks written notice to schedule a supervisor. ***Please note that this supervisor is provided to help train your staff in the proper installation of the Myrtha Pool components, and not to install the pool components alone.***

Guarantee – Myrtha offers a 25-year guarantee on Myrtha wall and structural components and 10-year guarantee on floor membrane. ***There is a one-year guarantee on all other components.***

Sincerely,

A&T Europe / Myrtha Pools USA

<u>REFERENCES:</u> All of our US and worldwide references are available on our website, but here are just a sampling relevant projects to the currently proposed scope of work.

PRINCETON PARKS & REC, PRINCETON, NEW JERSEY

SIMPSON PARK, LAKELAND, FLORIDA

MIAMI DADE COLLEGE, MIAMI, FLORIDA

MEMORIAL POOL, PASCO, WASHINGTON

Benefits of Utilizing Myrtha Technology

July 12th, 2016

1) Flexibility of the timing of the installation of the pool structure: with the Myrtha technology the pool contractor is not having to spend the time forming, pouring, stripping and curing the concrete for the pool walls; therefore the pool walls (and entire pool structure) can be constructed/installed at whatever point in the schedule of the construction phase is best for the project and project team. For example; if the application is an indoor aquatic facility, the pool slab and Myrtha footings can be installed at the beginning of construction; prior to the building structure footings being installed so that the cost and time of utilizing shoring at a later date (to protect the already installed shallower building footings) in the project can be alleviated. The Myrtha pool wall structure can be installed immediately after the pool slab and footings are constructed ***or*** this task can wait until the end portion of the project, after the other sub trades have completed their work in the natatorium; specifically any overhead work in the natatorium. In this case, the pool slab can be used by the sub trades to utilize their man lifts to complete their scope of work. Once the sub trades have completed their work, the Myrtha pool walls and pool interior finishes can be installed, pool decks poured and the project turned over to the client. This flexibility in the sequencing of the installation of the Myrtha pool components has proven to be very beneficial on all aquatic facilities as this allows the general contractor and the rest of the construction team to execute their other scopes of work in the most convenient and safest environment; you simply don't have this flexibility and convenience when constructing conventional concrete/plaster/tile pools.
2) Accessibility is always a challenge when constructing aquatic facilities and because all of the Myrtha components will fit through a walk-in door there is never a need for additional cost for larger access points or longer construction schedules in order to accommodate the Myrtha pool installation. To the contrary, the Myrtha technology allows for a seamless, efficient and simple installation process.
3) Expedited Construction Schedule – the Myrtha technology has proven countless times that is reduces the construction timeline for the swimming pool portion of construction in comparison to the conventional construction methods of concrete/plaster/tile pools. On

average, the Myrtha technology reduces the construction timeline required for a 50M pool by 8 weeks, a 25M x 25yd pool by 6 weeks and an average size leisure pool by 7 weeks. This savings of time can be directly realized by the client as a cost savings when the general contractor and construction team implement these savings of time and sequence of construction into their master schedule. The typical savings just on general conditions for the entire construction team is approximately $15,000.00/week ($60,000.00/month); funds the client can save or spend on other items they wish.

4) Ease of installation is another benefit of the Myrtha technology. Because the Myrtha product comes pre-engineered from the factory the components are "installation ready". Any Myrtha technician and crew are able to install the Myrtha technology whenever the schedule allows. With the Myrtha technology the pool contractor is not relying on the availability of plaster, tile, shotcrete and forming subcontractors in order to construct the pool. This is especially important in times like this when all of the subcontractors are so busy and overbooked in this strong economy.
5) Water tightness is important in any swimming pool application as no client wants a leaky pool. With the Myrtha technology it is easy to confirm the water tightness of the pool because of the ability to confirm the installation of the pool wall and gutter seam sealing and the pool floor membrane sealing. With a concrete/plaster/tile pool there is never the ability to confirm that the concrete structure isn't leaking, and if it is, where do you start to look for the mystery leak? Leaks cost lots of time, money and headache.
6) Ease of operation for the pool operators is a benefit to any client. The simplistic and durable PVC finish to the interior of the Myrtha pool allows for ease of chemical balancing for the pool operators at all times. With plastered pools there is always a challenge in balancing the pool water because of the chemical reaction of the pool chemicals with the cementitious plaster product that continually releases alkaline into the pool water; this is just the nature of plaster. There is a proven history with reduced chemical usage at Myrtha pools we have constructed verses plastered pools.
7) Proactive construction planning is another benefit of utilizing the Myrtha technology. We typically have the Myrtha technology delivered to the site at least 4-6 weeks prior to the scheduled start of the installation of this portion of the pools. This allows us and the rest of the construction team to move forward with the installation of the Myrtha technology ahead of schedule in the event the rest of the project is ahead of schedule. With concrete/plaster/tile pools it is likely that those subcontractors that would perform

these critical path tasks would be scheduled on other projects and therefore we wouldn't be able to start the installation of the pool early and reduce the timeline for construction.

8) Precision and accuracy of construction are at the highest level when utilizing the Myrtha technology. Because the entire Myrtha package is pre-engineered, competition pools are manufactured to the millimeter at the Myrtha factory and then installed to the millimeter in the field. Likewise with leisure pools that have freeform elements to them, the radiuses' are fabricated to the exact radius on the plans at the factory and can only be installed in the same accurate fashion in the field. Conventional construction of concrete/plaster/tile pools leaves the precision and accuracy of construction to the trade's person in the field doing their best. Utilizing the Myrtha technology removes the "guesswork" and human error from the equation to ensure the client is receiving a pool that is exactly as designed and engineered per the plans; priceless when constructing a competition pool.
9) Warranty speaks for itself; the Myrtha warranty of 25 years on the Myrtha structural components verses the typical 1 year warranty of the concrete/plaster/tile components of a concrete/plaster/tile pool speaks to itself as to which type of pool you can expect the best long-term performance from.
10) Significantly reduced need for under pool plumbing with the Myrtha system provides a very valuable benefit to the client for a couple of reasons: 1) any recirculation piping that would typically need to be installed under the pool slab in order for floor inlets to be installed is negated with the Myrtha specific side wall inlets that accomplish the same (or better) pool return water circulation requirement. This pool recirculation return piping is now routed and placed around the perimeter of the pool which reduces the amount of PVC required to accomplish the same result (reduced cost of PVC) and allows much easier access to this piping in the future provided that there is an issue with any of the piping. In traditional concrete/plaster/tile pools the client would have to remove pool deck, pool slab and pool plaster in order to remedy a potential issue with this same piping because it has to be routed under the pool slab. 2) The only under pool piping required in a Myrtha pool is the main drain suction lines. This limited amount of under pool piping required in a Myrtha pool expedites the installation of each swimming pool by 1-2 weeks which is unattainable with a concrete/plaster/tile pool.

INTERNATIONAL POOL CONSTRUCTORS 1891 Wharncliffe Road S. London, Ontario, N6L 1K2
519.859.6959 253.278.7999

April 25, 2014

Guy Copeland
Bird Construction
Re: Pan Am Aquatic Centre -Myrtha vs tiled concrete pool construction

Dear Sir,

We are approaching the handover date for this project, and, for the first time, we have been able to compare the construction of Myrtha Pool Technology with tiled concrete construction on the same project (of course, we have built many Myrtha Pools and many concrete pools, just not on the same project). We wanted to share our observations with you, as they are compelling, and offer valuable insights for future project considerations.

At the Pan Am Aquatic Centre in Toronto ("PAAC"), we have been engaged to construct 3 pools for the 2015 Pan Am/Para Pan Games. There is a 52-metre 10-lane FINA Competition Pool, built with the Myrtha Pool Technology, a 52-metre 10-lane Training Pool built with Myrtha Pool Technology, and a 25-metre FINA Diving Pool built with cast-in-place concrete construction with ceramic tile finish. The Competition and Training pools both feature 2 Myrtha movable bulkheads, and the Training pool features dual movable floors. The Dive pool is designed to 5m depth to accommodate FINA 1-metre and 3-metre springboard diving as well as FINA 3m/5m/7.5m/10m tower diving. The Aquatics Consultant on the project is Councilman-Hunsaker, and the Design-Build Contractor is PCL Constructors Canada Inc.

Schedule
- Myrtha Installs much faster than tiled concrete.
- Myrtha installation schedule is very flexible.
- Risk to schedule is minimized with Myrtha.

With less than 7 weeks remaining in our construction schedule, the Myrtha Pools are well advanced. The Myrtha Training pool is now ready to be filled and commissioned, the Myrtha Competition pool is being sealed, and membrane works, needing 2-3 weeks, will commence shortly. These pools have been surveyed by a licensed surveyor and are dimensionally correct to within +/-2mm, much more precise than required by FINA. As usual, the Myrtha Pools have installed quickly, accurately and coordination with bulkheads, movable floors, mechanical fittings and competition accessories has been simple, using proven solutions provided by a single source. The biggest challenge we have faced on the Myrtha Pools has been in sourcing and purchasing custom tiles for the edge of the gutters, but these are on site now, and will be fully installed before the handover in July.

In contrast, the concrete Dive pool presents serious challenges to our schedule. The concrete tank has been formed and concrete placed. It is noteworthy that the time required to form and pour the raw tank for this single, smaller pool has far exceeded the time required to construct the concrete bases for the Myrtha Pools, install and set the Myrtha structures, install the movable floors, install the bulkheads, and completely finish the Training pool. By the time the Competition pool is completed, in 3-4 weeks, it seems likely that we will not have completed the waterproofing of the Dive pool, much less the tile installation, grouting, testing and accessory installations.

Here is a quick review of the critical path timelines for these pools:

Training Pool:

• Underground Piping – Excavation, Piping & Pressure test.	13 days
• Form and cast concrete base slab, including step depression for double moveable floor. (Steel reinforcing by others) and 2m corridor slab.	6 days
• Erect pool walls, including gutters and buttresses	41 days
• Sealing and apply wall targets.	15 days
• Installation of link plate and gutter grating.	14 days
• Installation of double moveable floor	20 days
• Installation of 2 – 1m wide moveable bulkheads and headwall	18 days
• Installation of floor membrane and lane lines.	25 days
Total critical path time	152 days

Competition Pool:

• Underground Piping – Excavation, piping & Pressure test.	12 days
• Form and cast concrete base slab, including step depression for double moveable floor. (Steel reinforcing by others) and 2m corridor slab.	4 days
• Erect pool walls including gutters and buttresses	36 days
• Sealing panels and apply wall targets	17 days
• Installation of link plate and gutter grating	14 days
• Installation of 2 – 1m wide moveable bulkheads	18 days
• Installation of floor membrane and lane lines.	29 days
Total critical path time.	130 days

Dive Pool:

• Underground piping – Excavation, Piping & Pressure test	10 days
• Form & Pour 4 walls, including toe ledge and steps	72 days
• Strip forms and effect repairs. (Honeycombing etc.)	10 days
• Water fill @ 25mm/hr. and test time	15 days
• Standing water test	7 days
• Thickset mortar bed.	10 days
• Waterproofing	12 days
• Install gutter grating	7 days
• Waterproofing cure time.	7 days
• Water fill @ 25mm/hr. and test time.	15 days
• Tile tanks with targets and lane markings.	45 days.

Total critical path time	210 days

As you can see, the 2 Myrtha Pools were completed in the same time frame as a much smaller pool to the waterproofing stage. On this project, the dive pool will cause our portion of the work to delay turnover of the project on time.
Further, the Myrtha design allowed the corridor slab on grade, as well as the pool deck level suspended slab around the pools to be constructed prior to the erection of the pools, eliminating the need for additional concrete works after the installation of the pool tanks. Conversely, the dive tank had to be installed and backfilled prior to the structural level 1 slab being installed and subsequent slab on grade casting to be placed after both the dive tank pour and structural slab pour. This created scheduling issues, access issues and intense coordination issues that resulted in significant delays in the completion of these works.
Thus, the risk to our schedule is significantly reduced using Myrtha technology, and therefore, the risk to the overall project schedule is reduced too. We believe that the project schedule for PAAC could not have been achieved if all 3 pools had been concrete – the pool construction would have delayed all other stages of building construction. We estimate that Myrtha reduced the overall project schedule by 4 months or more.

Other items to consider:

- Accuracy of the installation – to within 2mm in length and width. (critical for competition venues)
- Cleanliness of installation – Once pool components are in the building, no waste to dispose of.
- Minimum impact on other trades and their schedule.
- No variance of end product from shop drawings. Once shops are approved the pool is manufactured to the precise details on the drawings.
- Predictable delivery times for all phases of manufacture and construction.
- Not as weather dependant as concrete and tile construction. Can be assembled in adverse weather conditions.
- 25 year warranty
- Official Pool Partner of Swimming Canada and FINA

Regards;

INTERNATIONAL POOL CONSTRUCTORS INC.

Walter Schmoll
519.652.3257 X 22
519.859.6959 (C)

TECHNOLOGY COMPARISON FOR GROUND CONSTRUCTION			
Topic	Myrtha	Concrete Construction	Alternate Steel Technology
Double Safety Waterproofing system	Double safety Myrtha patent system - two waterproofing screens built within the floor system	Single waterproofing screen	Single waterproofing screen
Structure settlement	Micro movement absorbed without affecting the waterproofing of the body of water due to elastic joints	Micro movements cause cracks affecting the waterproofing system	Welded steel with rigid joints
Seismic Rating	Category 5 - Worst accidental events - Remaining into elastic field stress	Depending on the structural factors considered	Depending on the structural factors considered
Construction	Completely dry contruction. Simplistic construction and can be assembled with standard construction tools (wrench/impacts , hammer drill, theodolite/laser levels)	Wet construction. Requires specialised equipment such as concrete pumps, screeters, cranes etc.	Dry construction. Requires specialised equipment and labour such as welders/welding equipment. Sometimes pre assembly and cranes are required
Speed of Installation	Reduces by weeks the speed of installation compared to traditional concrete construction. Materials can be carried through a common elevator or site bucket.	Requires significant cure time for cementitious products. Requires crane and high-pressure pumps.	Crane hours requested to lift the floor beams in place
Risk management	Being a pre-engineered package installation schedule and costs are predictable and guaranteed. All components are included and well integrated.	N/A	Depending on individual installer
Inlet system	Myrtha patent 90mm WALL inlets with double gasket system - no cast in or blocking out of concrete	Floor inlets/Wall inlets - requires cast in or blocking out. Resulting in more labour or possible broken fittings/plumbing	Standard wall/floor inlet systems
Bottom drain system	Wall main drains - no cast in or blocking out of concrete	Floor drains - perforation in concrete	Wall main drains - no cast in or blocking out of concrete
Ricirculation control	Custom made computational fluid dynamic analisys (CFD) - total control of dynamic pressure affecting the users in every spot - total control of disinfection - total control of turbolence	No CFD analysis available - approximate control of water and user factors	No CFD analysis available - approximate control of water and user factors
Warranty	25/10 years - Single source warranty	1 to 2 year - Several third-party warrenties involved	25y limited warranty
Maintenance	Minimal annual maintenance for at least 25 years - All joints accessible - ability to inspect entire pool - Immediate detection of minor leaking point	Resurfacing recommended by industry bodies every 5 to 7years. Difficult to identify leaking spots l - Interruption of the activities if intervention needed	No data
Maintenance program	Offers a specialized maintenance program performed by company - certified personnel	N/A	No data
Capacity to follow Free form profiles	From a minimum radius of 150mm (corresponding to a very sharp profile) up to any radius desired	Any radius	Comparable to Myrtha
Integration with theming	Any theming allowed - in house custom design	Any theming allowed - custom design	Any theming allowed - custom design
Integration with acrylic surfaces	Pre-engineered matching integration allowed	Dependent on Individual Contractor	Dependent on Individual Contractor
Weight	< 65 lbs per LF	> 450 lbs per ft	> 150bs per ft (not including structural steel floor supports)

Myrtha Pools®

MYRTHA COMPARISION

Foundations	Structural lightweight Footing required	Heavy spread foundations	Heavy steel beams
Structural Components	Stainless steel AISI441, AISI470 and AISI316 (Commonly refered to as Marine Grade)	Concrete	AISI 304 or galvanized steel
Floor Slab Requirements	None required for install.	Heavy structurally integral slab required.	Heavy steel beams
Lighting system	In house spectacular LED lighting system sycronized with music and water games	Third party sourced lighting system	Third party sourced lighting system
Antislip surface	Where required, Not abrasive	Depending on the finish and its behavior during time	Depending on the finish and its behavior during time
Long term projection and upgrades	Being a prefabricated structure can be partially or completely removed quietly, no demo works required	Aggressive hacking and demo works causing discomfort	Comparable to Myrtha
Experience	50+ Years, 18,000 installations in 72 Countries	Dependent on Individual Installer	Dependent on Individual Installer
References	Multiple Resort facilities worldwide.	Multiple Resort facilities worldwide.	Multiple Resort facilities worldwide.
In-house design support	Team of engineers licensed throughout the world	Team of licensed engineers	Team of licensed engineers
Quality control	IAPMO, DSA and ISO 9001 Certified Manufacturing	Dependent on Individual Installer and Supplier	Dependent on Individual Installer and Supplier
Customer care	In house	None	Depending on supplier
Green Attributes	50% reduction in carbon footprint from conventional construction.	Carbon Heavy Technology	Carbon Heavy Technology
Accessories	Custom System Based	3rd Party Provided	3rd Party Provided

Myrtha Pools®

TUPELO AQUATIC CENTER
RECOMMENDED TWENTY YEAR MAINTENANCE FORECAST
IARY OF COST DIFFERENTIAL BETWEEN CONCRETE/PLASTER AND MYRTHA

COMBINED POOLS	Year 5	Year 10	Year 15	Year 20	GRAND TOTAL
CONCRETE/PLASTER POOLS					
Annual Maintenance Cost	68,800	254,250	258,250	298,050	879,350
Lost Revenue During Downtime	80,500	112,000	91,000	112,000	395,500
TOTALS	149,300	366,250	349,250	410,050	1,274,850
MYRTHA POOLS					
Annual Maintenance Cost	13,200	15,050	15,700	59,750	103,700
Lost Revenue During Downtime	14,000	17,500	17,500	31,500	80,500
TOTALS	27,200	32,550	33,200	91,250	184,200
TOTAL MYRTHA COST SAVINGS	**122,100**	**333,700**	**316,050**	**318,800**	**1,090,650**

TOTAL MYRTHA POOL SAVINGS OVER 20 YEARS

$ 1,090,650

AVERAGE SAVINGS PER YEAR

$ 54,533

Appendix C

Stainless Steel Panel System Information

71 45

STATE OF CONNECTICUT

STATE DEPARTMENT OF HEALTH

79 ELM STREET HARTFORD, CONNECTICUT 06115

OFFICE OF PUBLIC HEALTH

Telephone No. 566-2762

Name: David G. Dickson, Asst. Supt.
Parks Department

Date: January 22, 1976

Address: City Hall

Town: Bristol

Subject: Page Park Swimming Pool Renovations No. 75-01-470, City of Bristol.

(X) For your information.

( ) Please note special recommendations.

( ) Follow-up report requested.

( ) For necessary action.

(X) Remarks: The plans for the proposed renovations of the subject pool have been reviewed by this office and hereby approved. Enclosed you will note an attached report summarizing the proposed renovations submitted and approved. Adequate pool maintenance shall be provided in accordance with Section 19-13-B33a of the Public Health Code to secure good operation and, if necessary in the future, changes in operational procedure and/or equipment shall be made to produce satisfactory conditions.

Gregory Bonadies, Senior Sanitarian
Environmental Health Services Division

mm

cc: Armanno W. Ciccarelli, M.D., Director of Health of Bristol
Mr. Carl Mike, Building Inspector, City of Bristol
Robert L. Reynolds, Van Zelm, Heywood & Shadford, Inc., 1007 Farmington Ave.
West Hartford, Conn. 06107

CONNECTICUT STATE DEPARTMENT OF HEALTH

January 21, 1976

ENVIRONMENTAL HEALTH SERVICES

cc: David G. Dickson, Asst. Supt.
Parks Department

Armanno W. Ciccarelli, M.D.
DOH - Bristol

SUBJECT: BRISTOL, CONN., REVIEW OF PLANS AND SPECIFICATIONS FOR THE RENOVATIONS OF PAGE PARK SWIMMING POOL, NO 75-01-470 ON JANUARY 21, 1976.

To: David G. Wiggin, Director
Environmental Health Services Division

From: Gregory Bonadies, Senior Sanitarian

Plans for the renovation of the subject pool have been received by this office on January 12, 1976 and the letter for revision required for the pool heater on January 19, 1976.

The following are the proposed renovations submitted for review:

1. To replace old piping with new PVC pipes.

2. To disconnect the existing deck drains from the recirculation system and reconnect to the sanitary waste line. The connection shall be air-gapped.

3. To repipe the existing gutter drains to the lint and hair catcher of the recirculation system.

4. To replace the existing pool vacuum system with a portable vacuum cleaner.

5. To replace the existing chlorinator with a positive displacement hypochlorinator rated at 120 gpd at 60 psig.

6. To add a pool heater with a flow velocity through the heater piping of six feet per second or less.

7. To provide a chemical feeder for pH adjustment.

CONCLUSIONS

The review of the plans indicate that the proposed renovations meet the Conn. State Department of Health regulations and are hereby approved as submitted.

GB/m

VAN ZELM, HEYWOOD & SHADFORD, INC. MECHANICAL AND ELECTRICAL ENGINEERS
1007 FARMINGTON AVENUE, WEST HARTFORD, CONNECTICUT 06107 TELEPHONE (203) 236-5426

STATE DEPARTMENT OF HEALTH
ENVIRONMENTAL
Permanent
JAN 12 1976
Transitory
Discard Date
File Code

RICHARD J. SHADFORD, P.E.
President
KENNETH G. BURR, P.E.
Secretary-Treasurer
WALTER J. T. HEYWOOD, P.E.
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EDWARD ADAJIAN
DONALD K. SEGEE
LAWRENCE O. TEMPLETON
FRANK L. UDVARY

HENRI B. vanZELM, P.E.
Consultant

January 8, 1976

Re: City of Bristol, Conn.
Page Park Pool Renovations
75-01-470

Connecticut State Department of Health
Environmental Health Division
79 Elm Street
Hartford, Conn. 06115

Gentlemen:

Please find enclosed one set of prints showing our proposed piping revisions and additions at Page Park Pool in Bristol. Also enclosed are relevent design data and specification excerpts for your review.

The purpose of these renovations is as follows:

Cast iron PVC same sizes

ok 1. To replace a variety of old piping materials with new pipe.

ok 2. To reconnect those existing deck drains which were tied into the pool circulation system into a sanitary waste line.

ok 3. To repipe the existing gutter drains so that this water will pass through the main circulation system strainer.

ok 4. To replace the present pool vacuum system with a portable cleaning machine.

ok 5. To replace the present gaseous chlorination system with a sodium hypochlorate solution system.

ok 6. To provide a chemical feed pump for feeding soda ash for Ph control in lieu of present manual operation.

ok 7. To provide an automated control panel for continuously monitoring and controling free chlorine and Ph.

Revision necessary 8. To add a pool heater to improve and extend the operating season.

Copper Tubing 2" + 2" systems Vol. 9.2

Revised 1-13-76

It is our understanding, from a telephone conversation with your Division, that a formal application will not be required for these renovations, and that approved plans will be sufficient.

If there is any forther information you require to complete your review, please let us know.

Very truly yours,

Robert L. Reynolds

Robert L. Reynolds
van Zelm, Heywood & Shadford, Inc.

cc: Mr. David G. Dickson - City of Bristol

1096 STATE STREET, SPRINGFIELD, MASSACHUSETTS 01109 TELEPHONE (413) 734-3675

VAN ZELM, HEYWOOD & SHADFORD, INC. MECHANICAL AND ELECTRICAL ENGINEERS
1007 FARMINGTON AVENUE, WEST HARTFORD, CONNECTICUT 06107 TELEPHONE (203) 236-5426

STATE DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH SERVICES
Permanent
JAN 19 1976
Transfer Date
Discard Date
File Code

RICHARD J. SHADFORD, P.E. President
KENNETH G. BURR, P.E. Secretary-Treasurer
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EDWARD ADAJIAN
DONALD K. SEGEE
LAWRENCE O. TEMPLETON
FRANK L. UDVARY
HENRI B. vanZELM, P.E. Consultant

January 15, 1976

Re: City of Bristol, Conn.
Page Park Pool Renovations
75-01-470

Mr. Bonadies
Connecticut State Department of Health
Environmental Health Division
79 Elm Street
Hartford, CT. 06115

Dear Mr. Bonadies:

We have revised our pool heater design flow as requested by you in our telephone conversation today. We have reduced the design flow from 180 gpm to 110 gpm thru the 4" bypass piping, which would result in a flow of 55 gpm through each of the two 2" heat exchangers. Referring to the enclosed water velocity chart for Type L copper tubing, 55 gpm through a 2" pipe corresponds to a water velocity of less than 6 feet per second as required by your regulations. The new temperature differential through the heater corresponding to this reduced flow will be 160° F.

Although we are reducing the flow through the 4" PVC bypass piping, we will retain this size in order to gain a velocity reduction through this pipe.

This letter revises our calculations previously sent to you dated, 1/7/76.

Please call if you have any further questions.

Very truly yours,

Robert L. Reynolds

Robert L. Reynolds
vanZelm, Heywood & Shadford, Inc.

RLR:mpa

cc: Mr. David G. Dickson - City of Bristol

1096 STATE STREET, SPRINGFIELD, MASSACHUSETTS 01109 TELEPHONE (413) 734-3675

1.01 SCOPE OF WORK

A. Provide all labor, materials, services, equipment and transportation necessary to install, complete and ready for continuous operation all plumbing systems indicated on the Contract Drawings, as specified herein or both, including, but not limited to the following items.

B. Replace the pool piping system, with the exception of the buried main drain piping and the sanitary line running through tunnel, with new pipe as specified elsewhere in the Section, throughout the tunnel surrounding the pool and to a point in the Filter Room indicated on the Contract Drawings. Existing gutter, deck, main drain and other drainage specialties are to remain.

C. Reroute the gutter and skimmer drains to pass through the main hair and lint strainer.

D. Reroute the deck drain pipe from the two existing deck drains at the north end of the pool to the storm system.

E. Remove existing gas chlorination system and install a new hypochlorinator system.

F. Remove the existing vacuum piping system and cap all branches at pool walls inside tunnel.

G. Provide a new soda ash feeder.

H. Provide an automated control system for the monitoring and feeding of pool chemicals.

I. Install all required hangers and supports for all piping installed under this Contract, and provide additional support for remaining existing tunnel piping as required.

J. Provide a pool heater complete with stack, piping, etc.

K. Provide an automated self-propelled immersion type pool cleaner.

L. Minor cutting and patching of tunnel side of pool walls as required for the removal of old piping and installation of new piping.

M. Removal and replacement or reinstallation of existing windows, doors, etc., as required for the installation of new mechanical equipment.

EQUIPMENT

6.01 GENERAL REU IREMENTS

A. Provide the new pool water control and treatment equipment and accessories for use with the existing and/or new pool circulation piping system.

B. Provide an automated immersion-type pool cleaner and accessories.

6.02 AUTOMATIC POOL MONITORING AND CONTROL SYSTEM

A. Provide a completely integrated electronic monitor and control system to monitor and control continuously the pH level and chlorine residual of the swimming pool water.

B. Bidding Procedure: This Specification is based on Strantrol Model and shall be the mandatory base bid. Bids must also be obtained from at least one, preferably two, of the following: Penwalt, Wallace & Tiernan, Paddock or Natatron. Control unit manufacturer shall be prepared to offer evidence of successful applications of their system, which have been in operation not less than one year and preferably in the Southern New England area where the Owner and engineer can see and discuss the installation with the Owner or operator of the equipment.

C. It is recognized that there are slight differences in construction, sensing method and circuitry between the several named manufacturers and this Specification, while based on one manufacturer is not intended to preclude others from bidding, providing the quality, accuracy and basic intent of the Specification is not violated. The proposals, however, must point out and describe briefly any such differences. The following features, however, are mandatory requirements:

1. Solid state circuitry

2. Flow switch to disable feed circuit in event of loss of flow

3. Unaffected by extremes of humidity, temperatures between 25° F. and 125° F., and noise. Response time not to exceed 10 seconds from moment sample reaches analyzer.

4. pH control accuracy to $\pm$ 0.1 pH

5. Residual free chlorine accuracy to equivalent $\pm$ 0.1 ppm

6. Essentially maintenance free sensors

7. Provisions for manual feeding

8. 7-day recording charts

9. "Push-to-Test" pilot lights for all alarms and functions

D. The complete panel and instrumentation system shall be guaranteed for one (1) year from date of start-up against all defects in workmanship and materials and failure to control as specified.

E. Control unit shall be based on Strantrol Model 311R with externally mounted recorders for both pH and chlorine. Both the chlorine and pH circuitry shall be completely unitized and independent of each other, and shall be capable of replacement without affecting the operation of the other circuit board.

F. Panelboard: Cabinet shall be free-standing constructed of stainless steel or suitably protected with rust-resistant primers and acrylic enamels designed for installation in humid atmosphere. Cabinet shall be NEMA type 3 or type 4. Cabinet shall provide ready access to components, and shall be lockable to prevent unauthorized tampering with both internals, sensors and adjustments. Convenience outlets for ON-OFF 115-volt control outputs shall be provided on the side of the cabinet as shall an ON-OFF switch for the audible alarm.

G. The following instrumentation shall be mounted on the front panel:

1. ON-OFF power switch

2. Operation mode selector switch for normal operation or super chlorination

3. Three-position pH control switch: Manual-Off-Auto

4. pH set-level control knob

5. pH direct reading meter

6. Three-position chlorine control switch: Manual-Off-Auto

7. Chlorine set-level control knob

8. Chlorine direct reading meter

9. Indicating lights for: System power ON
   Sample stream flowing
   ON-OFF power output to chlorinator pump

   Indicating lights for: ON-OFF power output to pH control pump
   High pH alarm, visual and audible
   Low pH alarm, visual and audible
   High chlorine alarm, visual and audible
   Low chlorine alarm, visual and audible

H. Provide separate fuse protection for control outputs and internal circuits.

I. A flow switch equal to McDonnell & Miller, located in the sample stream under-cabinet piping kit, shall provide positive cut-off of all chemical feed in the event of a flow failure in the main recirculation system or the sample stream piping. Flow switch shall be of a type which can be wired to provide an alarm signal in the event of sample stream flow failure.

J. During overnight operation, the chemical feeders controlled by the instrument system shall be placed on stand-by for periodic activation at pre-set intervals if the need for chemical treatment is indicated to the sensing electrodes. The timing device shall also be used to activate the chemical feed pump which provides completely automatic regeneration and maintenance of the sensing electrodes once in each 24-hour period. Maintenance of the electrodes shall be completely automatic such that no manual handling or cleaning of the electrodes is required. Acid for this automatic maintenance operation shall be stored in the shipping container, and shall be pumped directly from this container to the chlorine sensor cell.

K. pH and chlorine control flow sensors shall be provided with sensing electrodes of glass and platinum. Preamplification stages shall be epoxy-potted, mini-circuit assemblies immediately adjacent to the electrodes.

L. Reference electrodes shall be unbreakable, and shall contain a one year's supply of KCL saturated crystals, with non-clogging liquid junctions. Reference cells shall be of a quick twist-out configuration to provide access to the sensing electrodes and liquid junctions. External pressurization shall not be required in the reference electrode to overcome sample stream pressure. The flow sensors shall be rated for at least 100 psi operating pressure, and electrodes shall not require manual handling or cleaning at any time.

M. pH control signal output shall be OFF-ON 115-volt, and shall be capable of operating a relay or chemical metering pump.

N. Chlorine control shall be by potentiometric sensing and control of that fraction of free-available chlorine which exists as hypochlorous acid. Oxidation reduction potential sensing and control range shall be from ± 500 to ± 700 millivolts. Control accuracy shall be equivalent to ± 0.1 ppm free-available chlorine. Chlorine control signal output shall be OFF-ON 115-volt, and shall be capable of operating a relay or chemical metering pump.

O. <u>Alarms, Gauges and Recorders</u>: The LOW pH alarm circuit shall take corrective action by means of acid feed lock-out, and shall alert the operator when such alarm occurs.

HIGH pH alarm shall take corrective action by means of locking out soda ash or caustic feed, and shall alert operator when such alarm occurs. LOW chlorine alarm shall alert the operator when such alarm occurs. HIGH chlorine alarm shall take corrective action by means of chlorine feed lock-out, and shall alert the operator when such alarm occurs.

The instrument shall be provided with two direct reading gauges. One for pH and one for chlorine residual. The chlorine residual gauge shall read in millivolts as ORP (oxidation-reduction-potential).

The system shall be provided with two sixty (60) day chart recorders to record the following parameters:

pH level and feed events
chlorine residual and feed events

The ON-OFF feed events shall be recorded in frequency of occurance, time and duration.

P. Accessory Equipment and Supplies:

There shall be furnished with the instrument system the following:

1. One year's supply of recorder charts for both pH and chlorine readout

2. One Benson No. 10621-21 acid clean pump for regeneration and maintenance of sensing electrodes

3. One Benson No. 10621-61 acid feed pump to reduce pH levels in pool.

4. One Benson No. 40309 30-gallon capacity polyethylene tank with cover for storage or muriatic acid solution.

5. One Current relay, 115V/single phase, for ON-OFF control of hypochlorite feeder.

6. One calibrator/test unit.

Q. Start-Up: Supervision of installation, start-up of system, calibration of instrument and instruction of operating personnel shall be performed by an authorized representative of the manufacturer.

6.03 PIPING FOR AUTOMATION SYSTEM

A. The Contractor shall rpovide all required piping connections between the pool circulation piping system and the chemical feed pumps and the control panel sensors, complete with all fittings, valves, adapters, etc. as specified herein and as required by the control panel manufacturer.

B. This piping includes but is not limited to the following:

1. 1/2" PVC flow pipe from discharge side of pool circulating pump to the control panel termination which shall consist of a shutoff valve and hose connection adapter. Near the connector to the pool circulation piping, provide a shutoff valve, strainer and a union connection on the panel side of the strainer.

2. 3/4" PVC return pipe from a shutoff valve with hose connection adapter at the panel to the suction side of the pool circulation pump. Provide a shutoff valve adjacent to the connection with the pool circulation piping.

3. Pipe shall be rigid PVC schedule 40, and shall be adequately and rigidly supported throughout, all as specified in Subsection 15.2.

6.04 CHEMICAL FEEDERS

A. Provide one (1) chemical feeder for chlorination and one (1) chemical feeder for feeding soda ash solution, as made by Wallace and Tiernan, Proportioneers or Precision equal to Precision Model 9701-21, 5.0 gph at 60 psig. Motors to be 115-volt single-phase, 60-hertz.

B. Feeders shall be capable of flow adjustment from .5 to 5 gph.

C. Each feeder shall be supplied with individual stand and 55 gallon PVC tank, pipe, valves and fittings for complete installation.

6.05 POOL WATER TEST KIT

A. Provide a test kit for both the pH and chlorine residual. Kit to be equal to W.A. Taylor slide type, Model (J) Catalog #1223, or Wallace & Tiernan U-2374 with prismatic eyepiece and one (1) disk. pH slide or disk to indicate pH values of from 7.6 to 8.8, and chlorine residuals of from 0.1 to 4.0 ppm. Testing equipment to be provided with a carrying case.

6.06 AUTOMATED POOL CLEANER

A. Provide an automated immersion-type pool cleaner equal to "Aqua King" as manufactured by Florida Machine of Boca Raton.

B. All components of the submersible unit shall be of non-corrosive or corrosion-resistant material. All castings shall be of corrosion-resistant aluminum alloy.

C. Motor shall be oil-filled submersible type, 3/4 HP, 120-volt, single-phase, 1725 rpm with automatic reset circuit breaker. Provide with 150' power cord with 3 14-gauge conductors encased in vinyl tubing.

D. Reduction drive unit shall provide a final drive ratio of 80:1 by means of a permanently lubricated bronze worn gear enclosed in aluminum alloy casing. Rear wheels shall be driven by a molded glass-filled Delron planetary gear. Front wheels shall be belt-driven.

E. Filter unit shall be self-contained, perforated aluminum housing with cast aluminum endplates. Filter media to be corrugated, resin-impregnated paper with a porosity of 20 microns. Provide with six (6) replacement filters.

F. Provide with optional gearbox adaptor and standard carrying cart.

G. Unit shall be field-adjusted at time of delivery by an authorized representative of the Manufacfurer to provide uninterrupted and smooth operation throughout the pool. Particular attention shall be paid to the unit's ability to negotiate the ledge located at the deep end of the pool. Following these field adjustments, the operation of the unit shall be demonstrated to the Engineer and Owner.

PAGE PARK POOL

SECTION 15.7

HEATING

7.01 GENERAL REQUIREMENTS

A. Provide a factory-packaged, oil-fired pool heater and all piping, valves, insulation accessories, etc. necessary to provide a complete pool water heating system.

B. Refer to other subsections of this Mechanical Section for piping materials, valves, stack and breeching, insulation, and other components of this heating system.

7.02 POOL HEATER

A. Provide an indirect oil-fired pool heater equal to Bryan Model L40WP. Heater shall be capable of producing 2160 MBH when fired with No. 2 fuel oil at a rate of 20.0 GPH. Unit to be designed for operation on 120 volt, single phase power.

B. Heater shall be mounted on a heavy steel base frame, and be shipped complete with integral forced draft fan, oil burner, burner controls, boiler trim and prewired control panel.

C. Complete unit shall be approved by the Underwriters' Laboratories and bear their label. Heater shall be designed, constructed, tested, and stamped in accordance with ASME Low Pressure Heating Boiler Code.

D. Integral removable heat exchanger(s) shall be constructed of seamless copper tubes and bronze heads, and shall be suitable for use with swimming pool water.

E. Heater jacket shall be constructed of minimum 16 gauge steel and be fully insulated. Jacket panels shall be removable.

F. The following trim and accessories shall be included as part of the heater package provided by the Manufacturer:

1. Thermometer
2. Pressure Gauge
3. Aquastat
4. Combustion Safety Controls
5. Relief Valve, ASME rated, side outlet, lever handle, bronze construction
6. Expansion Tank, ASME labeled, 125 psig working pressure
7. Low Water Cutoff
8. Automatic Boiler Fill Valve
9. Pool Water Temperature Controller
10. Barometric Draft Control
11. Prewired Control Panel

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH AND ADDICTION SERVICES

July 26, 1993

Joseph F. Murphy, General Manager
Pools by Murphy and Sons, Inc.
36 Commerce Circle
Durham, CT 06422

Re: Proposed Renovations to Filtration System at Page Park Pool in Bristol, CT

Dear Mr. Murphy:

Our office is in receipt of your submitted proposal for replacement of the filtration system at the Page Park swimming pool in Bristol, Ct. This outdoor swimming pool was originally constructed in 1949 with renovations approved on January 22, 1976.

The proposed renovations are as follows:

1. Replace the existing filter with Neptune-Benson Model #78DRF-8 high rate sand filter system. This system consists of two (2) 78 inch diameter filters. The filters are NSF listed. Total filter area = 66.4 $ft.^2$.

2. Replace the existing recirculating pump with Weinman Model #6G30-4; rated at 950 gpm at 70 feet T.D.H.

3. Install flowmeter. Signet Model #MK515 - 8 inch pipe; scale 0-1800 GPM.

4. Install an over-the-rim fillspout adjacent to ladder.

<u>Calculations</u>

Pool Turnover: $\frac{330{,}000 \text{ gallons}}{950 \text{ GPM} \times 60} = 5.8 \text{ hrs.}$

Filtration Rate: $\frac{950 \text{ GPM}}{66.4 \text{ fT.}^2} = 14.3 \text{ gpm/fT.}^2$

A review of these proposed renovations indicates that these changes are in compliance with the Public Health Code Section 19-13-B33(b) and Public Swimming Pool Design specifications. Therefore, these renovations are approved.

Phone:
150 Washington Street — Hartford, CT 06106

These are the only revisions approved and all other plan and specifications previously approved remain in effect.

Sincerely,

William Sawicki

William Sawicki
Supervising Environmental Sanitarian
Recreational Health & Safety
Environmental Health Services Division

WS/cw(9000C)

cc: Phyllis Amodio, Principal Sanitarian
Bristol/Burlington Health District

Building Official - Bristol

BRISTOL-BURLINGTON HEALTH DISTRICT
240 Stafford Avenue
Bristol, Connecticut 06010-4617
Tel. (203) 584-7682 • Fax # 584-3814

RECEIVED
1993 JUL -9 AM 11:43
DEPT OF HEALTH SERVICES
ENVIRONMENTAL HEALTH

July 9, 1993

Joseph Murphy
Pools by Murphy & Sons Inc.
48 North Plains Industrial Road
Wallingford, Connecticut 06492

Re: Page Pool
Bristol,Connecticut

Dear Mr. Murphy:

A representative from our office conducted an inspection at the above referenced pool toward the end of June 1993. At that time an employee of your company working on the filtration system for this pool, told me to contact you concerning the permits needed for the work.

On June 29, 1993, I spoke to you about the work being done at Page Pool. The State Health Department should have been contacted prior to your work to indicate to you if you actually need a permit from their office. If the decision is made by the State that an application for a permit does not have to be made by your company, at least approval of your work must take place from the State. During our conversation you stated no permits had been taken out and provided information on what work you conducted including installation of a holding tank and the method of waste discharge currently being utilized. You ended our conversation by stating you would contact Mr. Homilski at the Connecticut State Health Department for his approval.

As of July 8, 1993, Mr Homilski has not received any information on this pool. Please contact his office upon receipt of this letter. Our office is looking for approval from the State Health Department concerning your work on the change in the filter system, the installation of the holding tank, the method of waste discharge and any other work performed at Page Pool in Bristol, Connecticut.

We anticipate your cooperation and look forward to approval from the State Health Department on your work performed. If you have any questions, please call our office at 584-7682. You can contact Mr. Homilski at the State Health Department at 566-1259.

Sincerely yours,

Phyllis Amodio R.S.

Phyllis Amodio, RS
Principal Sanitarian

cc: Mr. Homilski, State Health Dept.
Dennis Malone, Bristol Park Dept.

584-7682

RECEIVED
93 JUL 19 PM 1:05
DEPT. OF HEALTH SERVICES
ENVIRONMENTAL HEALTH

July 16, 1993

pools by murphy & sons INCORPORATED

36 Commerce Circle
Durham, CT 06422
(203) 349-9774
Fax (203) 349-9891

Branch Office
440 Main Street
Ridgefield, CT
(203) 438-9400
Fax (203) 438-3997

Mr. Bill Sawicki, Sanitarian
State of Connecticut Health Department
Preventable Diseases Division
Environmental Health Services Section
150 WAshington St
Hartford, CT 06106

re: Page Park Pool Filter Plant Replacement
Bristol, CT

Dear Mr. Sawicki:

In accord with our phone conversation of yesterday, on a maintenance basis, we recently replaced the dual pressure D.E. filters, one 30 h.p. pump, one flow-meter, all face piping and valves, and piping lines from pump(s) to filter, and from filter to existing return line with necessary valves. An existing 30 h.p. auxiliary/standby pump was plumbed in.

We did no work on the pool vessel itself. We did run a fill line from the equipment room, through the tunnel under the deck, up through the deck next to a ladder, with a permanent PVC over-the-rim fill spout with minimum 3" air gap. (The ladder is permanently installed.)

The existing 4" backwash line goes into a sanitary leaching system along with the toilets and showers from the building. We installed a 48" diameter, 124" high polyethylene holding tank for backwash. The tank holds 850 gallons.

We enclose specifications and flow rates for the new filter and pump. Your letter of approval should be directed to Mr. Dennis Malone, Director, Parks & Rec, Bristol, CT.

Please advise if you wish to meet for an on-site inspection.

Sincerely,

Pools by Murphy & Sons, Inc.

J. F. Murphy - Gen. Mgr.
JFM:hs
encl
cc: Dennis Malone

pools by murphy & sons INCORPORATED

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Durham, CT 06422
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Branch Office
440 Main Street
Ridgefield, CT
(203) 438-9400
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Page Park Pool
Bristol, CT

FILTER:

Neptune-Benson Model 78DRF-8 High Rate SAnd Filter System, standard non-code construction of HRS cafbon steel with "Flexsol 2000" lining.
System consists of two (2) 78" diameter tanks with lateral type PVC underdrain system, top distributor, 8" Schedule 80 pVC face piping, wafer style butterfly valves, two (2) panel mounted 4½" dial pressure gauges, 2" sight glass with pVC saddle, air relief and drain connections on adjustable jack legs with 14" x 18" manhole assembly. Includes manual single lever linkage

Model 78DRFL-SLM-6
Area 66.4 sq. ft.
Flow Rate: 950 GPM
Filtration Rate 14.3 GPM/sq. ft.
minimum backwash 475/950 GPM (single tank/dual tank)
maximum backwash 664/1328 GPM " "

PUMP:

Weinman Model 6G30-4 straight centrifugal
30 HP
950 gpm at 70' tdh

FLOWMETER:

Signet 8" Model MK515
0-1800 gpm on dial

Filter Area

78" = 6.5 ft r = 3.25

$A = \pi r^2$

$= (3.14)(3.25)^2 = (3.14)(10.56) = 33.16$

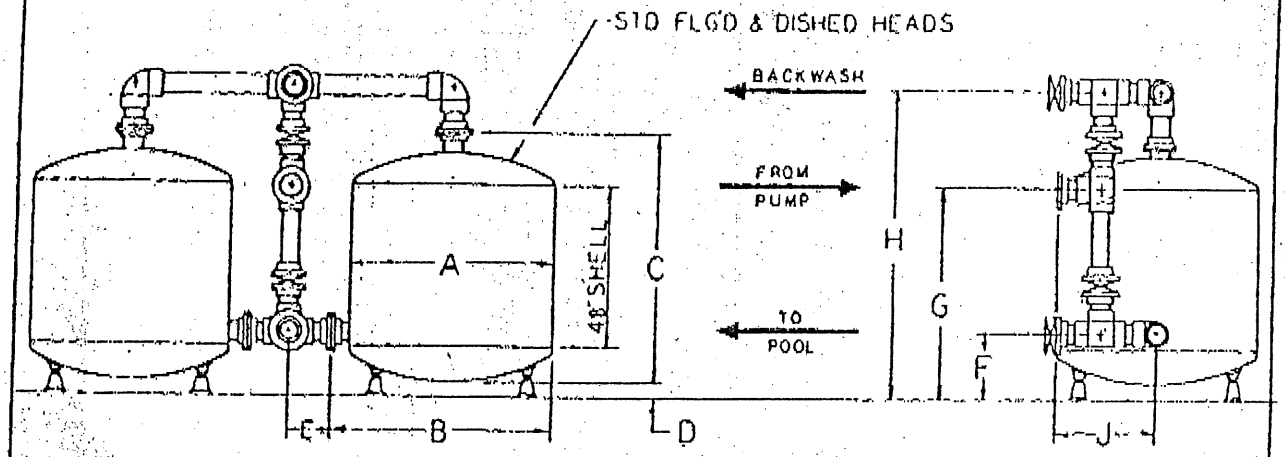
$\times$ 2 filter tanks

66.32

Filtration Rate

$950 \text{ gpm} / 66.4 \text{ ft}^2 = 14.3 \text{ gpm/ft}^2$

NEPTUNE RAPID FLOW FILTER SYSTEM
DRF DIMENSIONAL CHART



FILTER SIZE	FACE PIPING SIZE	A	B	C	D	E	F	G	H	J
36	3X3	36 3/8	41 5/16	64 1/2	5	10	15 1/4	54 7/16	76 5/16	21 3/8
	3X4	36 3/8	41 5/16	64 1/2	5	11	15 1/4	51 9/16	76 5/16	25
42	3X4	42 3/8	47 5/16	66 1/8	4	11	15	52 3/16	77 3/16	25
48	3X4	48 3/8	53 5/16	67 5/8	4	11	15 3/4	53 11/16	78 11/16	25
	4X6	48 3/8	53 9/16	67 5/8	4	13	16 1/4	51 9/16	79 11/16	33
54	4X6	54 3/8	59 5/16	69 5/8	4	13	17 1/4	53 9/16	81 11/16	33
60	4X6	60 3/8	65 9/16	71 1/4	3	13	17 1/8	54 3/16	82 5/16	33
66	4X6	66 1/2	71 5/8	72 3/4	3	13	17 7/8	55 11/16	83 13/16	33
	6X6	66 1/2	72	72 3/4	3	13	19	60 11/16	88 13/16	33
72	6X8	72 1/2	78	74 3/8	3	17	19 7/8	56 5/16	92 3/4	41 15/16
78	6X8	78 1/2	84	76 1/4	3	17	20 3/4	57 3/16	93 5/8	41 15/16
84	6X8	84 1/2	90	77 7/8	3	17	21 5/8	58 1/16	94 1/2	41 15/16
90	6X8	90 1/2	96	79 1/2	3	17	22 3/8	59 1/8	95 9/16	41 15/16
96	6X8	96 1/2	102	81 1/8	3	17	23 1/4	60 3/4	97 3/16	41 15/16
	8X8	96 1/2	102	81 1/8	3	17	23 1/4	64 3/4	101 3/16	41 15/16
102	6X8	102 5/8	108 1/16	83	3	17	24 1/8	62 5/8	99 1/16	41 15/16
	8X8	102 5/8	108 1/16	83	3	17	24 1/8	66 5/8	103 1/16	41 15/16
108	6X8	108 5/8	114 1/16	84 1/2	3	17	25	64 1/8	100 9/16	41 15/16
	8X8	108 5/8	114 1/16	84 1/2	3	17	25	68 1/8	104 9/16	41 15/16
114	6X8	114 5/8	120 1/16	86 1/8	3	17	25 3/4	65 3/4	102 3/16	41 15/16
	8X8	114 5/8	120 1/16	86 1/8	3	17	25 3/4	69 3/4	106 3/16	41 15/16
120	8X8	120 5/8	126 1/16	87 3/4	4	17	27 1/2	72 3/8	108 13/16	41 15/16

DWG NO 45a

Technical Information

NEPTUNE BENSON NSF

FILTER DIAMETER INCHES	SHIPPING WEIGHTS, LBS.				OPERATING WEIGHT, LBS. EACH TANK[4]	NUMBER JACKS PER TANK	LOAD PER JACK LBS.	BEARING PRESSURE PER JACK P.S.I.
	TANK[1]	INTERNALS[2] EACH TANK	FACE PIPING[3] SRF	FACE PIPING[3] DRF				
30	400	18	2" / 80	3" / 102	2989	3	996	67
36	500	20	3" / 90	3" / 105, 4" / 140	4173	3	1391	93
42	600	26	3" / 92	4" / 144	5738	3	1913	128
48	700	32	3" / 92, 4" / 137	4" / 147, 6" / 235	7421	3	2474	166
54	950	42	4" / 139	6" / 239	9496	4	2374	159
60	1100	52	4" / 141	6" / 241	11725	4	2931	196
66	1400	62	4", 6" / 152, 219	6" / 245	14922	4	3731	250
72	1550	86	6" / 224	6", 8" / 249, 51[illegible]	17857	4	4464	299
78	1925	96	6" / 226	8" / 513	21182	4	5296	355
84	2150	110	6" / 228	8" / 515	24705	4	6176	414
90	2400	124	6" / 230	8" / 519	28423	4	7106	476
96	2650	136	6" / 232	8" / 523	32435	4	8109	543
102	2900	150	6", 8" / 234, 270	8" / 525	38020	6	6337	425
108	3200	170	6", 8" / 240, 278	8" / 530	42949	6	7158	480
114	3525	195	8" / 287	8", 10" / 535, 590	48041	6	8007	537
120	3850	230	8" / 294	10" / 603	53836	6	8973	601

EACH TANK

[1] FOR FLEXSOL LINED TANKS MULTIPLY X 1.25

[2] BASED ON SCH. 80 PVC HEADER W/ SCH. 40 LATERAL

[3] BASED ON SCH. 80 PVC. FOR SLW ADD 26#. FOR SLA ADD 53#. FOR CRATING ADD 275#.

[4] INCLUDES WGT. OF LARGER PIPING. FOR DRF SYSTEMS MULTPLY X 2.

NEPTUNE BENSONE

technical information

SPLIT/FLANGED FILTERS AND BALANCING TANKS

THE PERFECT SOLUTION FOR RENOVATION PROJECTS WITH LIMITED ACCESS

FEATURES:

- WILL FIT THROUGH STANDARD SIZED DOORWAYS
- PERMITS EASY ASSEMBLY OF INTERNAL PIPING
- ALLOWS FOR SECURE PLACEMENT OF SUPPORT GRAVEL & FILTER MEDIA
- ONE PIECE FACTORY POSITIONED FULL FACE FLANGE GASKET
- MULTIPLE PIECES PROVIDE GREATER EASE OF HANDLING
- NSF LISTED

SPECIFICATIONS FOR SPLIT/FLANGED TANK DESIGN

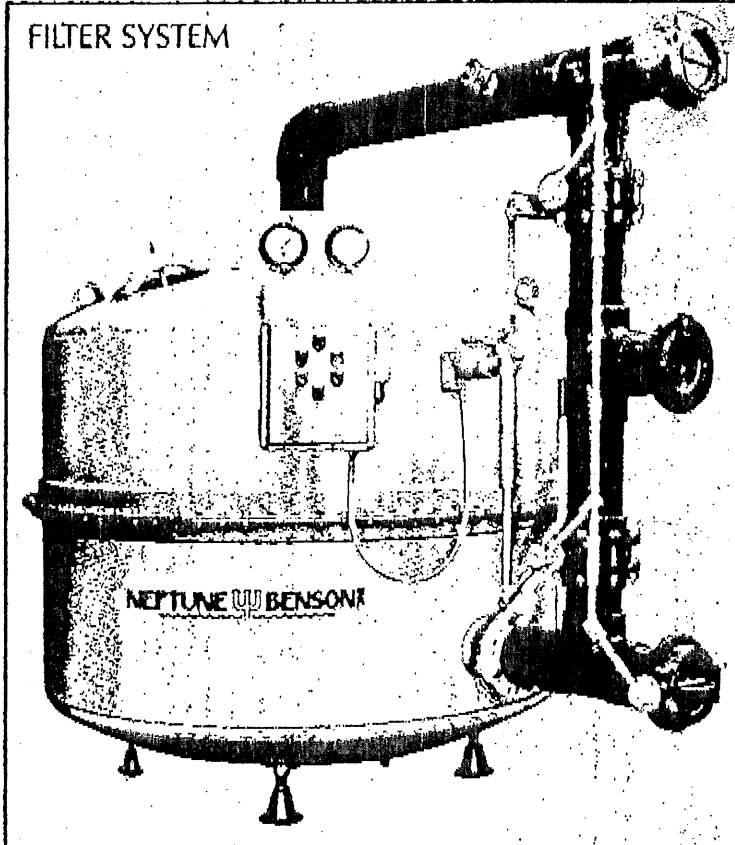
Tank shall be NSF listed as split/flanged vessel in the current NSF listing guide.

Tank shall be provided in _____ sections for field assembly so that no structural changes will be required for access. Minimum section sizes shall not exceed _____" x _____".

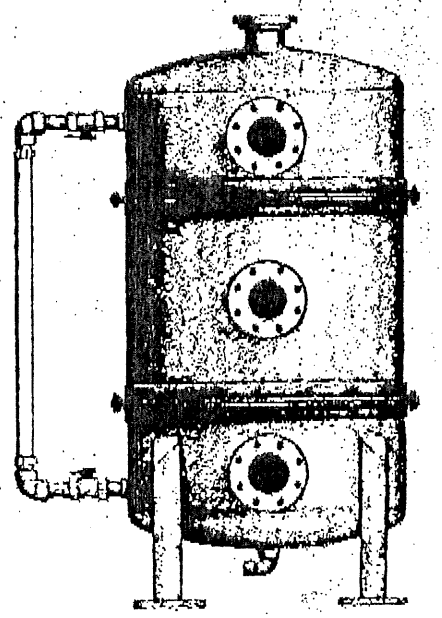
Each section shall be flanged using 3" x 3" x .375" rolled angle with holes drilled on 3" centers around the circumference. A .25" x 2.75" 40 durometer full faced neoprene gasket shall be used to provide the pressure seal. Grade 5 bolts .5" x 1.5", nuts and hardened washers shall be used to assemble the flanged joint. After assembly, the inside joint shall be sealed using permanent nitrile non-sag sealant.

No field welding shall be required or permitted.

FILTER SYSTEM



BALANCING TANK



SPLIT/FLANGED CONSTRUCTION DIMENSIONS

TANK DIA.	OUTSIDE FLANGE DIA.	FILTERS		BALANCING TANK*	
		2 PC.	3 PC.	2 PC.	3 PC.
36	42⅜	32⅛		40⅞	
42	48⅛	33		41¾	
48	54⅛	33¾		42½	
54	60⅛	34¼		43½	
60	66¾	35½		44¼	
66	72½	36¼		45	
72	78½	37⅛	26⅝	45¾	30½
78	84½	38	27½	46¾	31⅛
84	90½	38⅞	28⅛	47½	31¾
90	96½	39⅝	29⅛	48¼	32⅛
96	102½	40½	30	49⅛	32¾

EACH TANK

CHART NOTES

1. ALL DIMENSIONS IN INCHES.
2. BALANCING TANK DIMENSIONS ARE BASED ON 60" SIDE SHELL HEIGHT.
3. *DIMENSIONS FOR BALANCING TANK PIECES MAY BE AFFECTED BY LOCATION OF FITTINGS.
4. DIMENSIONS OF PIECES REPRESENT MAXIMUM OVERALL WIDTH.

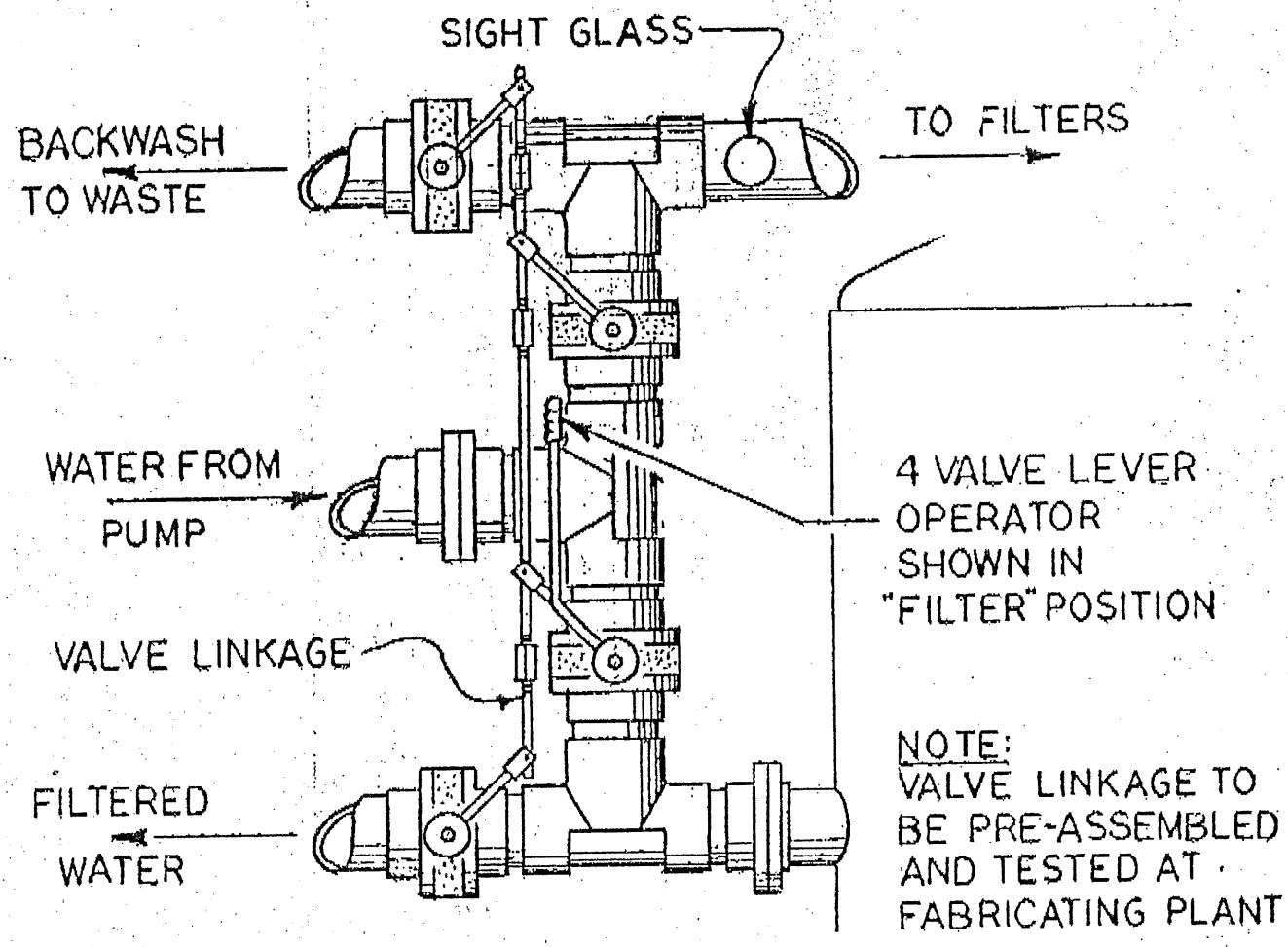
NSF

NEPTUNE BENSON INC PRODUCT BULLETIN

A Tradition of Leadership in Quality, Design and Service

One Bridal Avenue, P.O. Box 578, West Warwick, RI 02893 • Call TOLL-FREE 1-800-832-8002; within RI 401-821-2200

SINGLE LEVER LINKAGE
manual



SINGLE LEVER
VALVE AND LINKAGE ASSEMBLY

SIZE OF FACE PIPING 8"

FACE PIPING MAT'L

___ SCHEDULE 40 PVC
→ ___ SCHEDULE 80 PVC
___ GALVANIZED STEEL
___ STAINLESS STEEL
OTHER _____

N.S.F. DATA

LISTING NO. 5033
DESIGNATION - SLM

DWG NO. SLM-1

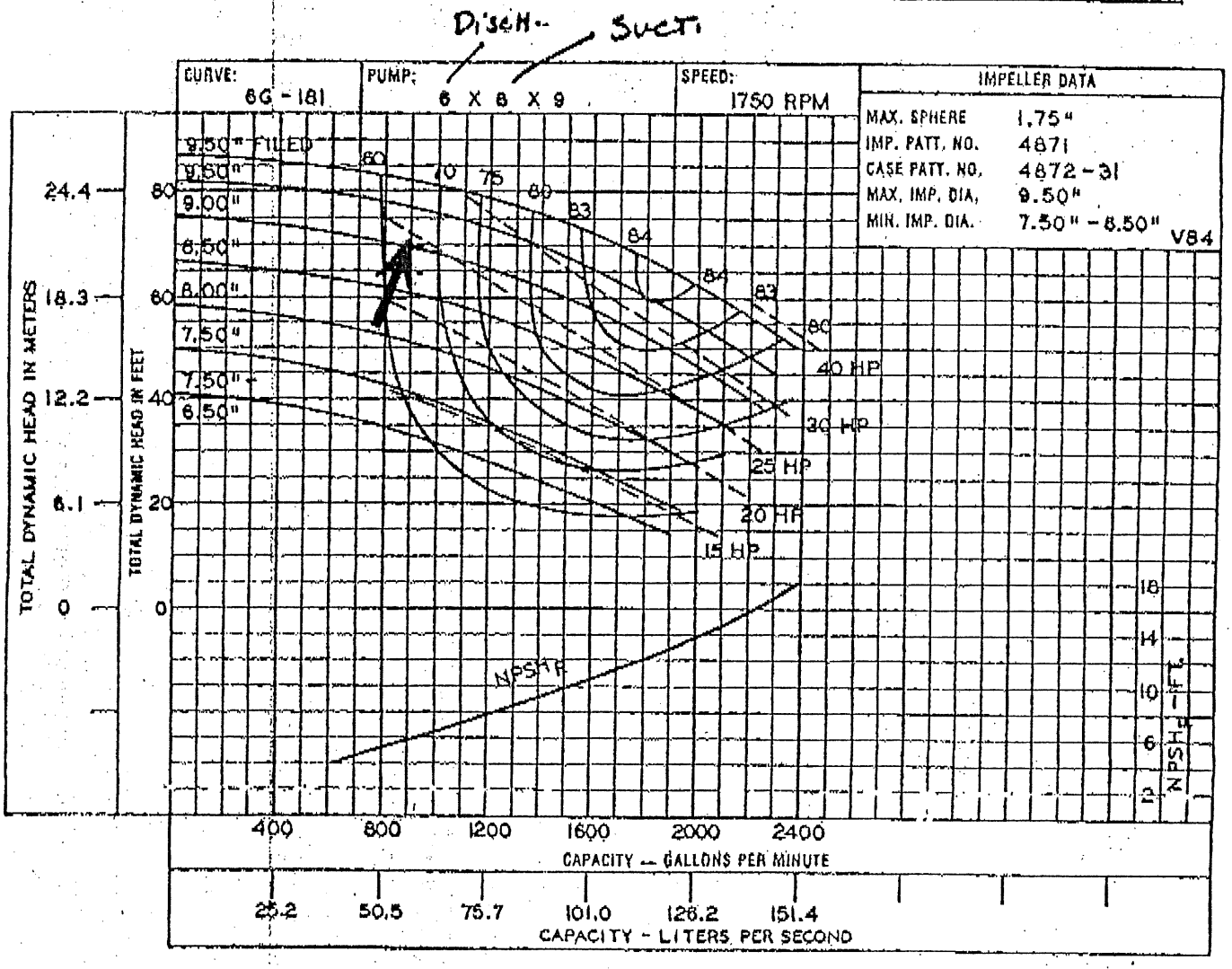
NEPTUNE ⅊ BENSON

WEINMAN

The head-capacity and efficiency curves apply only for liquids having a viscosity less than 40 SSU. Brake horsepower curves are based on a specific gravity of 1.00. To determine BHP for other liquids, multiply these values by the specific gravity. Only the condition listed below is guaranteed.

CAPACITY 935 GPM
TOTAL DYNAMIC HEAD 70 FEET
EFFICIENCY 68 %
BHP @ RATED GPM
MAX. BHP
NPSH REQ'D BY PUMP FEET
SERVICE

LIQUID
TEMPERATURE DEG F.
SPECIFIC GRAVITY
IMPELLER DIA.
PUMP SERIAL NO.
SUBMITAL DATE



6 x 8 x 9
1750 RPM
4871 IMPELLER

6G

REV. DATE: AUG. 15, 1988

FLOWMETERS

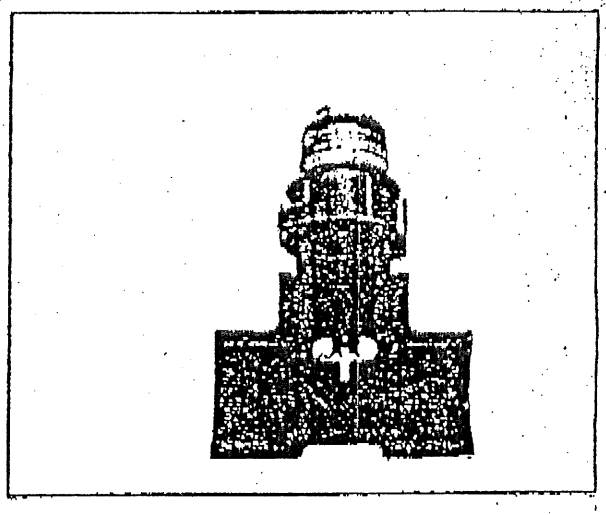
The Heart of the Flow System

These versatile flowsensors are designed to meet virtually any flow requirements from complex batching and mixing, to simple flowmonitoring. Designed for maximum versatility, Signet flowsensors can be used with a variety of pipe sizes and a wide range of liquids.

MK 515 PADDLEWHEEL FLOSENSOR

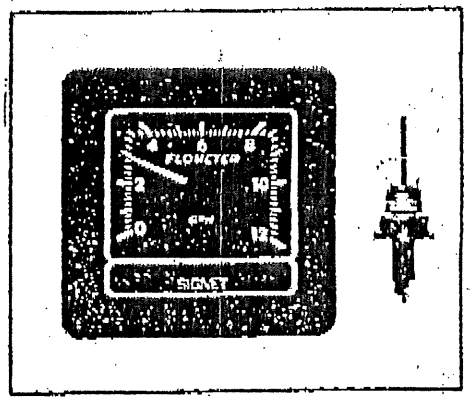
Signet's patented Paddlewheel Flosensor features a unique open-cell design that provides a repeatable, linear output over the entire range including:

- Linear repeatable output of ± 1% over full range (1-50 ft/sec)
- Simple installation & easy maintenance (will operate in almost any pipe size or material)
- Corrosion resistant materials do not affect flow characteristics of fluid measured
- 220° F (105°C) max. temp.
- 200 psig max. pressure at ambient temp.
- Variety of signal outputs available



SCALE RANGES

PIPE SIZE (Inches)	MINIMUM FLOW (GPM)	SCALE (GPM)
2	10.5	0-180
2½	15	0-300
3	23	0-300
4	39	0-500
5	61	0-1200
6	88	0-1200
8	154	0-1800
10	240	0-5000
12	346	0-8000

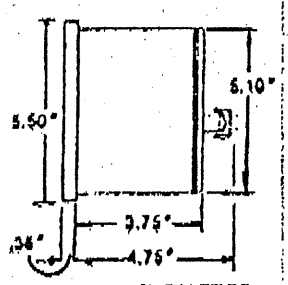


MK 509 SELF-POWERED FLOMETER

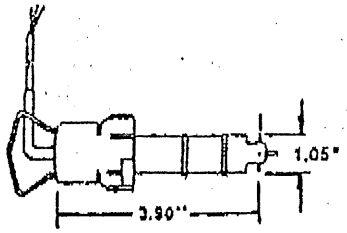
The MK 509 Flometer features a high reliability design that requires no external power to operate. This self-powered flometer is ideal for hazardous as well as normal conditions:

- Instrinsically safe design requires no electrical hookup for operation (up to velocities of 14 FPS)
- Accuracy ± 2% of full scale (± 1% between 30% and 70% of full scale)
- Repeatability ± 1% of full scale
- Ambient operating temperature 0°C to 60°C (32°F to 140°F)

DIMENSIONS



MK 509 FLOMETER



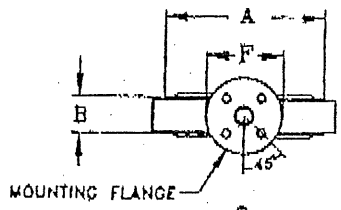
MK 515 PADDLEWHEEL FLOSENSOR

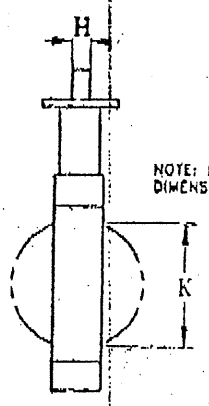
NEPTUNE BENSON

BUTTERFLY VALVES

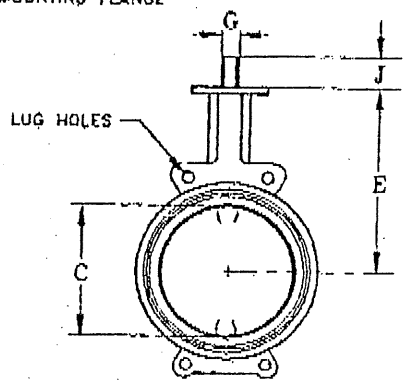
DIMENSIONS

VALVE SIZE	A	B	C	E	F	MOUNTING FLANGE DRILLING B.C.	NO. HOLES	HOLE DIA.	G	H	J	K	LUG BOLTING DATA B.C.	NO. HOLES	BOLT DIA.	WT. (lbs.)
2"	3.69	1.62	2.00	5.50	3.54	2.76	4	.38	.55	.39	1.25	1.32	4.75	4	5/8	8.5
2½"	4.19	1.75	2.50	6.00	3.54	2.76	4	.38	.55	.39	1.25	1.91	5.50	4	5/8	10.5
3"	4.88	1.75	3.00	6.25	3.54	2.76	4	.38	.55	.39	1.25	2.55	6.00	4	5/8	11.5
4"	6.06	2.00	4.00	7.00	3.54	2.76	4	.38	.63	.45	1.25	3.57	7.50	4	5/8	15.0
5"	7.12	2.12	5.00	7.50	3.54	2.76	4	.38	.75	.51	1.25	4.63	8.50	4	3/4	18.0
6"	8.12	2.12	5.75	8.00	3.54	2.76	4	.38	.75	.51	1.25	5.45	9.50	4	3/4	23.0
8"	10.50	2.50	7.75	9.50	5.91	4.92	4	.56	.87	.63	1.25	7.45	11.75	4	3/4	35.0
10"	12.75	2.50	9.75	10.75	5.91	4.92	4	.56	1.18	.87	2.00	9.53	14.25	4	7/8	56.0
12"	14.88	3.00	11.75	12.25	5.91	4.92	4	.56	1.18	.87	2.00	11.47	17.00	4	7/8	94.0

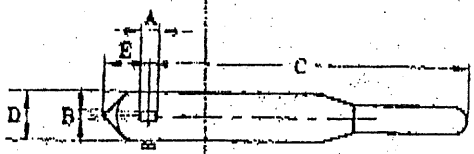




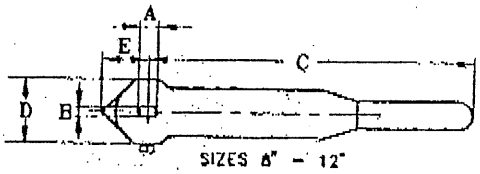
NOTE: K IS DISK CHORDAL DIMENSION AT VALVE FACE



HANDLE

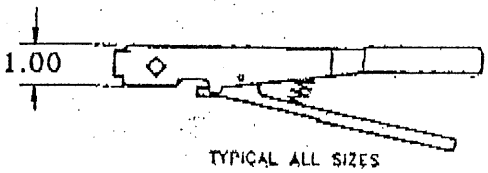


SIZES 2" - 6"



SIZES 8" - 12"

VALVE SIZE	A	B	C	D	E
2", 2½", 3"	.552	.395	10.62	1.38	1.12
4"	.631	.434	10.62	1.38	1.12
5", 6"	.749	.513	10.62	1.38	1.12
8"	.867	.631	11.75	2.00	1.62
10", 12"	1.182	.867	11.75	2.00	1.62

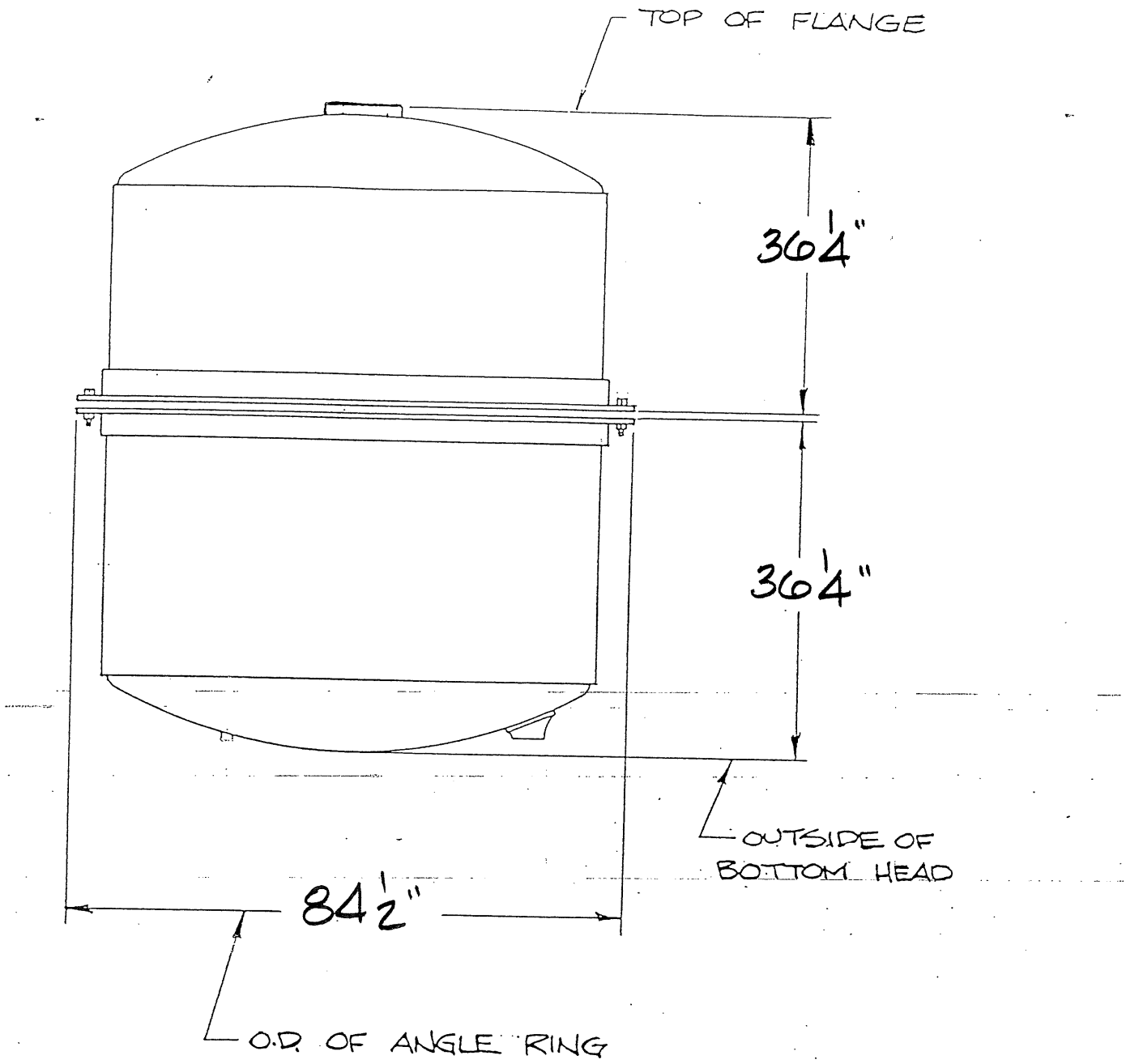


TYPICAL ALL SIZES

DRAWING NO. BV-1-D R.1

NEPTUNE BENSON INC

SPLIT - 2 PIECES



DRAWING NO.: ST-1