

AMERICAN FORK CITY COUNCIL
MAY 21, 2015
NOTICE OF WORK SESSION & AGENDA

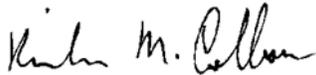
WORK SESSION

The purpose of City Work Sessions is to prepare the City Council for upcoming agenda items on future City Council Meetings. The Work Session is not an action item meeting. No one attending the meeting should rely on any discussion or any perceived consensus as action or authorization. These come only from the City Council Meeting.

Notice is hereby given that the American Fork City Council will meet in a work session on **Thursday, May 21, 2015**, in the **American Fork City Offices, 51 East Main Street**, commencing at **3:30 p.m.** The agenda shall be as follows:

1. Discussion on the Upper East 5 Million Gallon Culinary Water Tank Repair Options. – *Dale Goodman*
2. Presentation and discussion on revisions to the 900 East 700 North Project. – *Dale Goodman*
3. Discussion regarding the replacement of the air structure over the swimming pool at the Fitness Center. – *Derric Rykert*
4. Adjournment.

Dated this 19 day of May, 2015



Richard M. Colborn
City Recorder

CITY COUNCIL STUDY ITEM

City of American Fork
COUNCIL WORK SESSION
May 21, 2015

Department Public Works

Director Approval 

STUDY ITEM Discussion on the Upper East 5 Million Gallon Culinary Water Tank Repair Options.

SUMMARY RECOMMENDATION Staff recommends proceeding with the additional study to ensure the final decision of repair type is made with all facts known.

BACKGROUND This culinary tank was constructed in 1980 by a company called VSL. In recent years it has been experiencing concrete spalling on the upper wall near the lid and exposed reinforcement on the roof. Horrocks Engineers contracted with Structural Technologies to inspect the tank and provide recommendations and cost estimates for repairs. Structural Technologies, who purchased the firm VSL, had the original design files and staff familiar with the tank construction.

Two main items of concern were identified. First some roof cables are exposed to weather; and if not repaired, the cables could corrode causing the roof to collapse. Second due to design details and construction practices that were common at the time, the expansion and contraction of the walls of the tank lid have caused the upper portion of the wall to spall. A significant unknown is the condition of the existing walls and floor, which could be sampled to determine the life remaining.

Two repair options include the following:

Option 1: Patch the roof with a waterproof membrane and patch the walls with concrete grout, which is considered temporary in nature and does not fix the underlying cause. Cost - \$500,000 with an expected life of 20 years.

Option 2: Remove and replace the roof completely while patching the upper portion of the walls with concrete, which is considered permanent in nature and addresses the underlying causes of the failure. Cost - \$1,100,000 with an expected life of 40 years.

In order to verify if option two is a wise use of funds, an additional study of \$40,000 is required. Staff recommends this additional study as it will allow the City to determine the life cycle of the tank in association with the more expensive repair. If the balance of the tank will not remain competent to match the extended life cycle of the more expensive repair, then the less expensive

repair (Option 1) would be the logical choice. However, if the balance of the tank is in a condition that the life cycle can be extended, then the more expensive repair (Option 2) is the better choice.

BUDGET IMPACT Budget impact will vary based upon selected option.

ALTERNATIVES N/A

SUPPORTING DOCUMENTS

1. Letter from Horrocks Engineers dated March 23, 2015
2. Structural Technologies report dated January 23, 2015
3. Exhibit Map.

HOME Culinary Water

Details

Basemap



January 23, 2015

Mr. John Schiess, PE
Mr. Jared Olsen, PE
Horrocks Engineers
2162 W. Grove Parkway, Suite 400
Pleasant Grove, Utah 84062

Re: American Fork 5MG Reservoir – Upper East Tank
VSL Ref. No.: 417198

Dear Mr. Schiess and Mr. Olsen:

Pursuant to your request VStructural, LLC (VSL) has performed a field observation and condition assessment for the above captioned circular prestressed tank. The purpose of this letter is to present the results of VSL's assessment and provide our opinions and recommendations concerning the condition and potential rehabilitation of the tank structure.

Background

VSL was contacted by representatives of Horrocks Engineers and asked to assist with the condition assessment of the above captioned circular prestressed concrete tank. The tank was constructed by Dexon Construction in 1981 and utilizes internal tendons for prestressing. The prestressed tank design was provided by VSL Corporation, along with the prestressing materials. The tank is currently in service, performing acceptably and full of raw untreated water.

VSL understands that during a recent tank inspection and cleaning extensive spalling was documented and photographed at the top of the tank wall.

The tank wall is backfilled to within approximately 4 feet of the top of wall. The roof is exposed and uncoated.

Documents Reviewed

- Tank drawings by Horrocks Engineers dated August, 1980.
- Prestressed tank design drawings by VSL Corporation dated October 14, 1980.
- Rebar shop drawings by Marathon Steel Company dated October 27, 1980.
- Video and report of tank inspection by Clear Water Robotics dated April 3, 2012.
- Video of tank inspection/cleaning by Liquid Engineering Corporation dated September 24, 2014.

Confidential: Any unauthorized use or distribution is prohibited.

I:\Jobs\410000-419999\417198 American Fork 5MG Tank Roof Rehab#### Job\Correspondence\Report 1-23.docx 1/23/2015

Field Observations

A representative of VSL performed a field observation with representatives of Horrocks Engineers on December 17, 2014. The field observation included the exposed exterior portions of the tank wall and roof slab. Entry into the tank was not made during this observation and the tank was full of water.

The roof slab for this tank was placed in four equal size concrete placements, quadrants generally oriented N-S and E-W. The amount of concrete cover provided over the columns, top cover, is too thin. In many places there is no cover or possibly only 1/8", see *Figures 1 through 6*. The minimum amount of cover specified on the original VSL design drawings and required by the Building Code was 3/4". The northwest and southeast quadrants have many locations where the top reinforcing or cracking is visible over each column due to this thin cover. Previous concrete patching has been done to address the exposed reinforcing in several locations.

Bare steel tendon anchorages were used in the construction of this tank, see *Figures 7 and 8*. This was typical at the time and encapsulated, corrosion protected, anchors were not required by the code or standards.

The top of the concrete tank wall is severely spalled in many areas, see *Figures 9 through 12*. The spalling has exposed the vertical wall tendon anchorages and joint reinforcement to corrosion. The roof joint was detailed as a pinned connection with reinforcing bars through the joint and no bearing pads were incorporated into the joint detail.

At this point no tendon failures were observed. When a roof tendon fails it typically pops out of the anchorage, see *Figure 13* for an example.

Discussion

The style of prestressed tank constructed at this site in 1981 was typical of what the VSL Corporation was designing at the time. Many similar tanks exist in Utah and Colorado. The structural detailing and prestressing systems used in its construction are considered "first generation" by the current tendon tank industry.

This prestressed tank was designed and constructed using methods that are now covered by the AWWA D115 tank standard for Tendon-Prestressed Concrete Water Tanks. However, the first edition of the AWWA D115 standard was not published until 1986. Prior to the development of D115 the American Concrete Institute Committee 344 published a report for, primarily, wire-wound tanks in 1970. The ACI 344 report is referenced as the basis of design for this tank in the General Structural Notes of the VSL Corporation drawings.

The issue of thin concrete cover over the columns is a big threat to the continued serviceability of this tank. This is a construction defect that probably should have been caught by the inspectors at the time of construction. The concrete cover serves as the main corrosion protection for the post-tensioning tendons and the only corrosion protection for the critical

negative moment reinforcing over the columns. Without adequate concrete cover or protection of the reinforcing steel the exposed tendons will likely start failing in the next 5 years. After a certain amount of tendons are lost the slab will no longer be able to support snow loads or even its own self weight. A tank roof recently failed in a similar manner in Louisville, Colorado due to inadequate cover over the columns.

Because non-corrosion protected tendon anchorages were used in this tank, corrosion protection of them through quality concrete cover is critical. When tendons fail it is almost always at the anchorage where the wedges corrode and release the strand. Many tendon anchorages have been exposed around the perimeter of this tank due to concrete spalling and failure of the stressing pocket grout plugs. These tendons are exposed to moisture and corrosion, both from the outside environment and the humid interior of the tank. Vertical tendons are visible in the photos and video from the last interior tank inspection performed by Liquid Engineering Corporation. If left as is, many tendon failures should be expected in the near future, both in the tank roof and vertically in the tank wall. The tendons are considered critical reinforcement for this structure's ability to carry the required service loads: snow, water, seismic and backfill. Without them the tank could fail catastrophically.

The issue of concrete spalling at the top of the wall is another major concern for the long-term serviceability of this tank. As previously discussed the spalling has exposed the top anchorages of the vertical wall tendons to corrosion. This spalling also reduces the wall's ability to carry vertical loads from the roof slab. The cause of this spalling is thermal expansion and contraction of the roof slab which cannot be accommodated by the way the joint was detailed. The joint was detailed to be non-moving, as was customary at the time. Modern tank designs allow for this movement and incorporate flexible bearing pads into the joint.

Conclusions

The life expectancy of this "first generation" era tank is in VSL's professional opinion around 75 years. Without repairs continued degradation of this tank should be expected. Tendon failures in the roof and vertically in the wall will likely render the tank unusable within the next five to ten years.

The vertical tendons are critical for resistance of the vertical bending moments in the tank wall from interior water loads, exterior soil loads and seismic accelerations. If these tendons fail horizontal thru-wall cracking is expected. This will create further durability and serviceability issues for the tank.

The roof tendons are critical for the load carrying capacity of the slab. They must be protected from corrosion failures. If failures occur the broken tendons must be repaired or replaced. The tendons are not adequately protected now due to degradation of the tank concrete and improper concrete cover over the columns.

Due to the inability of the top of wall/roof joint to accommodate thermal movements it is not possible to permanently repair the top-of-wall spalling. Any concrete repairs made will most likely spall off again in the future.

A complete roof replacement is the best way to permanently address all of the structural issues. This will also greatly reduce the need for future tank inspections and maintenance.

Repair Options

Option 1 – Roof Coating and Top of Wall Patching

To address the issue of thin concrete cover over the columns a waterproof roof coating or membrane should be installed. This will protect the exposed tendons and reinforcing from moisture and corrosion. See the attached product data sheets from Themec for recommended coatings.

To address the top-of-wall and roof edge spalling localized concrete repairs can be performed, see *Detail 1*. However, due to continued thermal movements of the roof relative to the wall future spalling and continued repairs should be expected. The interior concrete repairs will be costly because of confined space requirements, difficulty getting materials into the tank and the scaffolding required for access.

A program of regular inspection and maintenance will be required for the remaining service life of this tank. The inspections should include the stressing pocket grout plugs and corrosion protection, cover, of the tendon anchorages. If faulty grout plugs are found they should be replaced. Any broken tendons found during future inspections should also be repaired. If repair of tendons is not possible then supplemental strengthening of the structure will be required.

Opinion of probable cost:

Roof Coating = \$175,000, coating will need to be replaced every 20 years.

Concrete Repairs = \$320,000, repairs will need to be made every 20 years.

Option 2 – Roof Replacement

Many other municipalities with similar “first generation” tendon tanks have opted for a complete roof replacement. VSL has recently participated in roof replacement projects for Mt. Pleasant UT, Beaver UT, and Louisville CO. This is the best way to properly address all of the structural issues. Also, during a roof replacement it is possible to permanently repair the top-of-wall spalling and provide detailing that accommodates future thermal movements, see *Detail 2*. Modern, fully encapsulated, corrosion protected prestressing systems will be used in a replacement roof slab.

After the roof is replaced this tank should be able to serve out the rest of its 75 year life expectancy, or longer, with little to no maintenance. A post-tensioned replacement roof can be easily procured through a design-build process. We would be happy to provide assistance with preparation of performance specifications and bid drawings.

Opinion of probable cost = \$900,000 plus or minus 20%

Thank you for the opportunity of serving you on this project. If you have any questions regarding this letter, or any aspect of the project, please do not hesitate to contact us.

Sincerely,

VStructural LLC



Anthony J. Galterio, PE, PMP
Senior Engineer



Attachments

Figures



Figure 1 – Thin concrete cover over column, exposed post-tensioning strands and previous patching.



Figure 2 - Thin concrete cover over column and exposed post-tensioning strands.



Figure 3 - Thin concrete cover over column with cracking over post-tensioning strands.



Figure 4 – Thin concrete cover over column and exposed post-tensioning strand.



Figure 5 – Thin concrete cover over column and exposed post-tensioning strands.



Figure 6 – Previous patching of thin concrete cover over column.



Figure 7 – Tendon anchorages exposed in roof slab edge.



Figure 8 – Tendon anchorages exposed in roof slab edge.



Figure 9 – Spalling at top of wall and exposed vertical wall post-tensioning anchors.



Figure 10 – Spalling at top of wall and exposed vertical wall post-tensioning anchors.



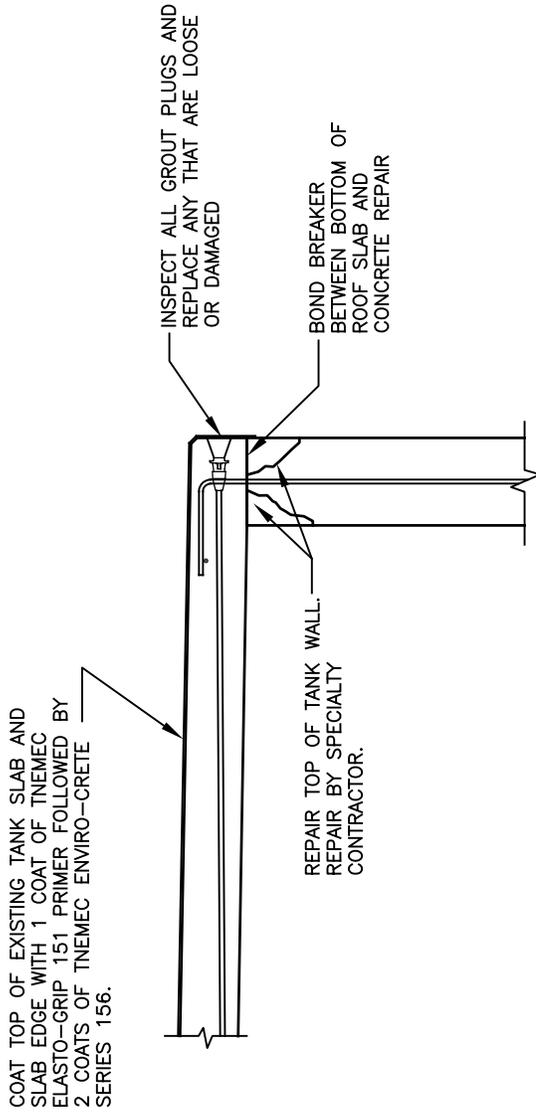
Figure 11 – Spalling at top of wall and exposed vertical wall post-tensioning anchors.



Figure 12 – Spalling at top of wall and exposed vertical wall post-tensioning anchors.



Figure 13 – Example of tendon failures from a similar tank in Utah.



SECTION AT WALL/ROOF JOINT

SCALE: N.T.S.

DATE:
1-21-15

DRAWN BY:
AJG

CHECKED BY:
AJG

DETAIL 1
DETAILS FOR ROOF COATING/REPAIR
AMERICAN FORK 5MG RESERVOIR
UPPER EAST TANK, UTAH

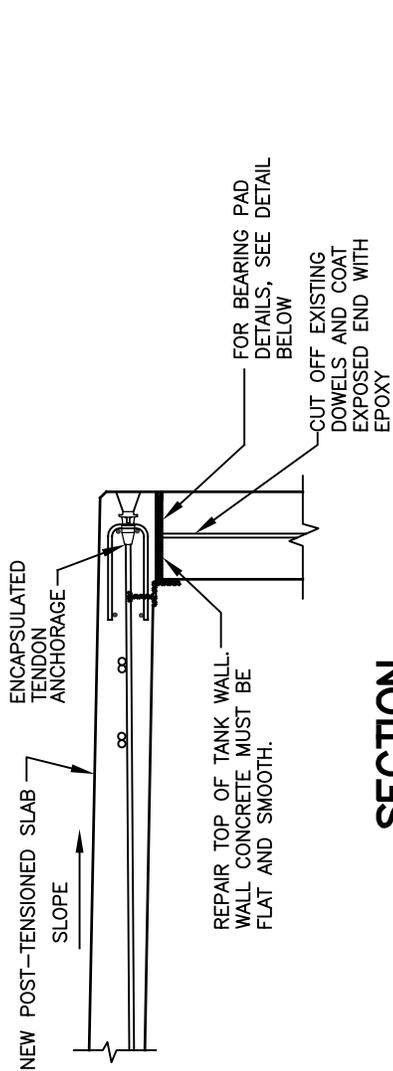


4825 VAN GORDON ST.
WHEAT RIDGE, CO 80033

JOB NO.:
417198

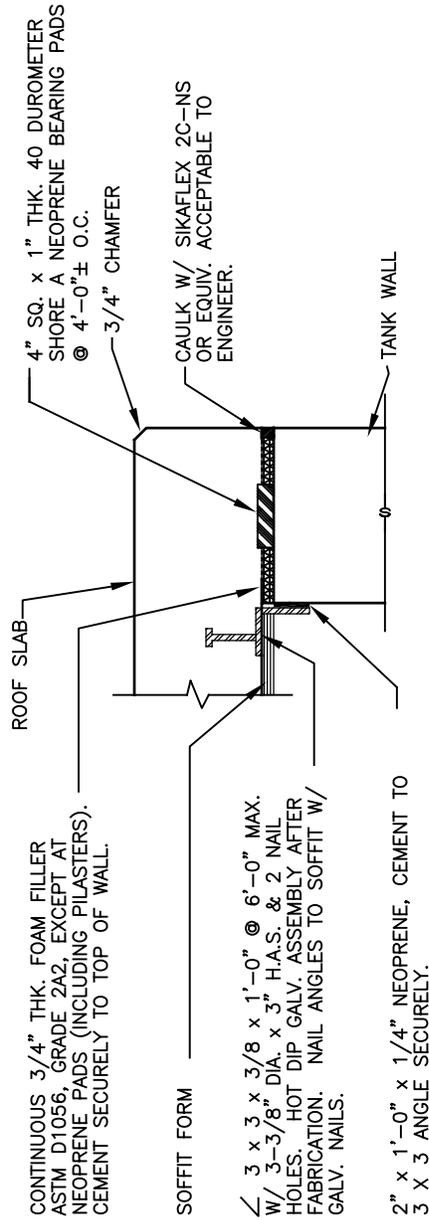
NO SCALE

PHONE: 303-456-9887
FAX: 303-456-9796



SECTION

SCALE: N.T.S.



BEARING PAD DETAIL

SCALE: N.T.S.

DATE:
1-21-15

DRAWN BY:
AJG

CHECKED BY:
AJG

DETAIL 2
SAMPLE JOINT DETAIL FOR ROOF REPLACEMENT
AMERICAN FORK 5MG RESERVOIR
UPPER EAST TANK, UTAH



4825 VAN GORDON ST.
WHEAT RIDGE, CO 80033

JOB NO.:
417198

NO SCALE

PHONE: 303-456-9887
FAX: 303-456-9796



ELASTO-GRIP® FC 151-1051

PRODUCT PROFILE

GENERIC DESCRIPTION Waterborne Modified Polyamine Epoxy

COMMON USAGE Penetrating, flexible and low-odor primer for sealing cementitious and other porous substrates. Also excellent as a tie-coat for specialized finishes over sound existing coatings.

COLORS Green

FINISH Matte

COATING SYSTEM

TOPCOATS Series 2H, 6, 30, L69, L69F, N69, N69F, V69, V69F, 84, 113, 114, 115, 156, 157, 158, 180, 181, 280, 1028, 1029

SURFACE PREPARATION

CRACKS Repair masonry as necessary with 152 tape. Refer to 152 product data sheet for additional details.

DRYWALL Sand joint compound smooth and feather edge.

WOOD Sand rough areas. Seal knots and pitch pockets. Fill cracks and nail holes after primer has cured.

PAINTED SURFACES Remove old paint not tightly bonded to the surface. A test patch is recommended to determine compatibility of 151 over unknown previously-applied coatings.

ALL SURFACES Must be clean, dry and free of oil, grease and other contaminants. Allow new concrete, plaster, stucco and masonry to cure for 14 days. Level protrusions and mortar spatter. Fill block with an appropriate masonry filler if a smoother appearance is desired.

TECHNICAL DATA

VOLUME SOLIDS 17.0 ± 2.0%

RECOMMENDED DFT 0.7 to 1.5 mils (18 to 38 microns) per coat (non-absorbent substrates).

CURING TIME

Temperature	To Touch	To Recoat
75°F (24°C) 50% Relative Humidity	1 1/2 hours	3 1/2 hours minimum 7 days maximum

If more than 7 days have elapsed after applying 151, apply a refresher coat before topcoating. Higher humidities and/or lower temperatures increase the cure time.

VOLATILE ORGANIC COMPOUNDS **Unthinned:** 1.46 lbs/gallon (175 grams/litre)

THEORETICAL COVERAGE 273 mil sq ft/gal (6.7 m²/L at 25 microns). See APPLICATION for coverage rates.

NUMBER OF COMPONENTS Two: Part A and Part B

PACKAGING Five-Gallon Kit: Consists of 4.0 gallons of Part A in a 5-gallon plastic pail and a full filled gallon can of Part B. When mixed, yields five gallons (18.9L).
One-Gallon Kit: Consists of a partially filled one-gallon can labeled Part A and a partially filled quart can labeled Part B. When mixed, yields one gallon (3.79L).

NET WEIGHT PER GALLON 8.58 ± 0.5 lbs (3.84 ± .11 kg) (mixed)

STORAGE TEMPERATURE Minimum 35°F (2°C) Maximum 110°F (43°C)

SHELF LIFE 24 months at recommended storage temperature.

FLASH POINT - SETA N/A

HEALTH & SAFETY Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product.
Keep out of the reach of children.

ELASTO-GRIP® FC | 151-1051

APPLICATION

COVERAGE RATES One gallon will cover from 180 to 400 sq ft (16.7 to 37.2 m²). Highly porous or rough/irregular surface will reduce coverage. Application of coating below minimum or above maximum dry mil thickness recommended may adversely affect coating performance.

MIXING Stir contents of the can marked Part A. Add the contents of the can marked Part B to Part A while under agitation. Continue agitation until the two components are thoroughly mixed. Do not use mixed material beyond pot life limits. Unused material must be kept tightly closed at all times.

THINNING Not recommended.

POT LIFE At 77°F (25°C): 12 hours.

APPLICATION EQUIPMENT

Airless Spray

Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
0.013"-0.019" (330-485 microns)	2500-3000 psi (172-207 bar)	1/4" or 3/8" (6.4 or 9.5 mm)	60 mesh (250 microns)

Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.

Roller: Use short synthetic nap rollers for smooth surfaces. Use long synthetic nap rollers for rough surfaces.

Brush: Soft nylon or synthetic bristles.

SURFACE TEMPERATURE Minimum 40°F (4°C) Maximum 120°F (49°C)

The surface should be dry and at least 5°F (3°C) above the dew point.

CLEANUP Flush and clean all equipment immediately after use with warm, soapy water. Flush spray equipment with a final rinse of ethanol or isopropyl alcohol.

WARRANTY & LIMITATION OF SELLER'S LIABILITY: Tnemec Company, Inc. warrants only that its coatings represented herein meet the formulation standards of Tnemec Company, Inc. THE WARRANTY DESCRIBED IN THE ABOVE PARAGRAPH SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. The buyer's sole and exclusive remedy against Tnemec Company, Inc. shall be for replacement of the product in the event a defective condition of the product should be found to exist and the exclusive remedy shall not have failed its essential purpose as long as Tnemec is willing to provide comparable replacement product to the buyer. NO OTHER REMEDY (INCLUDING, BUT NOT LIMITED TO, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, ENVIRONMENTAL INJURIES OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL LOSS) SHALL BE AVAILABLE TO THE BUYER. Technical and application information herein is provided for the purpose of establishing a general profile of the coating and proper coating application procedures. Test performance results were obtained in a controlled environment and Tnemec Company makes no claim that these tests or any other tests, accurately represent all environments. As application, environmental and design factors can vary significantly, due care should be exercised in the selection and use of the coating.



PRODUCT PROFILE

GENERIC DESCRIPTION Modified Waterborne Acrylate

COMMON USAGE Flexible, breathable coating primarily for concrete and masonry that can fill and bridge minor hairline cracks. Excellent elastomeric protection against driving rain, alternate freezing-thawing and UV light. Series 156 can also be used as a low cohesive stress overcoat for aged oil or alkyl systems.

COLORS Refer to Tnemec Color Guide. Series 156 is also available in 01AB Air Barrier Beige.

FINISH Matte — Smooth

SPECIAL QUALIFICATIONS Series 156 meets air barrier (A.B.) requirements of Massachusetts' Energy Code, 780 CMR Chapter 13.

PERFORMANCE CRITERIA Extensive test data available. Contact your Tnemec representative for specific test results.

COATING SYSTEM

PRIMERS **Concrete, Masonry and Wood:** Self-priming or Series 151-1051, 287
Plaster and Stucco: Series 151-1051, 287
Split-Face and Split-Fluted Block: Self-priming or Series 130-6602
Steel: Series 37H, 66, N69, N69F, L69, L69F, 90-97, 94-H₂O, 135, L140, L140F
Galvanized Steel & Non-Ferrous Metal: Series 66, L69, L69F, N69, N69F, 135
Other: Series 151 on treated or stained wood, drywall, highly absorbent surfaces and recommended sound existing coatings.

SURFACE PREPARATION

STEEL Refer to primer product data sheets for surface preparation recommendations.

GALVANIZED STEEL & NON-FERROUS METAL Surface preparation recommendations will vary depending on substrate and exposure conditions. Contact your Tnemec representative or Tnemec Technical Services.

CRACKS Fill hairline cracks less than 1/64 inch (.4 mm) wide by brushing Series 156 into them prior to applying Series 156 over the entire area to be coated. Most business cards are about 1/64 inch (.4 mm) thick. For cracks wider than 1/64 inch (.4 mm) and/or moving cracks, gaps and expansion joints use Series 152 Tnemec-Tape. Refer to Series 152 product data sheet for details. **Note:** Use Series 156 to embed Tnemec-Tape prior to topcoating with 156.

PAINTED SURFACES Remove chalk and old paint not tightly bonded to the surface. Apply test patch to check adhesion.

ALL SURFACES Must be clean, dry and free of oil, grease, form release agents and other contaminants. Allow new concrete, plaster, stucco and masonry to cure 14 days. Level protrusions and mortar spatter. Bare cementitious surfaces can be slightly dampened with clean water if product is drying too rapidly during application. Series 151 may improve adhesion on smooth surfaces. Reference SSPC-SP13/NACE 6.

TECHNICAL DATA

VOLUME SOLIDS 50.9 ± 2.0% †

RECOMMENDED DFT 4.0 to 8.0 mils (100 to 205 microns) per coat.

CURING TIME

Temperature	To Touch	To Handle	To Recoat
75°F (24°C) 50% Relative Humidity	1/2 hour	1-2 hours	1 1/4 hours

Curing time varies with surface temperature, air movement, humidity and film thickness.

VOLATILE ORGANIC COMPOUNDS **Unthinned-** 0.41 lbs/gallon (49 grams/litre) †

THEORETICAL COVERAGE 816 mil sq ft/gal (19.9 m²/L at 25 microns). Actual coverage will vary from about 100 to 200 sq ft (9.3 to 18.6 m²) per gallon dependent upon product, substrate and coating thickness. †

NUMBER OF COMPONENTS One

PACKAGING 5 gallon (18.9L) pails and 1 gallon (3.79L) cans. Yield: 5 gallons and 1 gallon respectively.

NET WEIGHT PER GALLON 11.77 ± 0.25 lbs (5.34 ± .23 kg) †

STORAGE TEMPERATURE Minimum 35°F (2°C) Maximum 110°F (43°C)

TEMPERATURE RESISTANCE (Dry) Continuous 175°F (79°C) Intermittent 185°F (85°C)

SHELF LIFE 24 months at recommended storage temperature.

FLASH POINT - SETA N/A

HEALTH & SAFETY Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product. **Keep out of the reach of children.**

ENVIRO-CRETE® | SERIES 156

APPLICATION

COVERAGE RATES

	Dry MILS (MICRONS)	Wet MILS (MICRONS)	Sq Ft/Gal (m ² /Gal)
Suggested	6.0 (150)	12.0 (305)	136 (12.6)
Minimum	4.0 (100)	8.0 (205)	204 (18.9)
Maximum	8.0 (205)	16.0 (405)	102 (9.5)

Allow for application losses and surface irregularities. Roller or brush application may require multiple coats to obtain recommended film thickness. *Important: Protection against weather, driving rain and alternate freezing and thawing is obtained when coating is applied to form a continuous, void-free film.* The coating must be brushed, rolled or sprayed and backrolled onto block. Grooves in scored and fluted block must be brushed. Two coats are normally recommended for lightweight or haydite block. Split-face and split-fluted block must be filled. Contact your Tnemec representative for specific coating system recommendations. Film thickness is rounded to the nearest 0.5 mil or 5 microns. Film thicknesses are calculated from the sq ft/gal figures. There is no method for accurately measuring the film thicknesses of this coating applied over a rough masonry substrate. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance. †

MIXING

Stir contents to a uniform consistency.

THINNING

Not recommended except when priming highly porous surfaces. Thin first coat 30% or 1 1/4 quarts (1.1L) per gallon with potable water.

APPLICATION EQUIPMENT

Airless Spray

Pump	Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
Graco 35:1 Senator or larger	0.019"-0.029" (480-735 microns)	2500-3000 psi (172-207 bar)	3/8" (9.5 mm)	30 mesh (600 microns)

Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.

Roller: Use a 3/8" to 1-1/2" (9.5 mm to 38 mm) synthetic woven nap roller cover. Use longer nap for rough or porous surfaces. Multiple coats may be required to achieve recommended film thickness, depending on applicator technique and roller nap size.

Brush: Use a good quality nylon or synthetic bristle brush.

SURFACE TEMPERATURE

Minimum 40°F (4°C) Maximum 100°F (38°C)
The surface should be dry and at least 5°F (3°C) above the dew point.

CLEANUP

Clean equipment immediately after use; brushes and rollers with hot, soapy water; spray equipment as follows:

1. Pump out excess material from equipment and lines.
2. Pump 10 gallons (40L) of clean water through airless pump or conventional pressure tank and lines.
3. Release pressure from pump or pressure tank and clean all parts and surfaces.
4. Reassemble and flush with clean water. Finish with a final flush of ethyl or isopropyl alcohol.

CAUTION

Dry overspray can be wiped or washed from most surfaces. Satisfactory dry-fall performance depends upon height of work, weather conditions, equipment adjustment and proper thinning. Test for each application as follows: Spray from 15 to 25 feet towards paint container. The material then should readily wipe off. **Note:** Heat can fuse-dry overspray to surfaces. Always clean dry overspray from hot surfaces before fusing occurs. Be aware that exterior surface temperatures can be higher than air temperature. Also, Series 156 has a tendency to show lap marks when spray applied to large, flat surfaces during hot weather. To minimize lap marks stay away from direct sunlight, pre-wet masonry substrates by misting with clean water and lightly backroll with 3/8" nap rollers immediately behind spray application.

† Values may vary with color.

WARRANTY & LIMITATION OF SELLER'S LIABILITY: Tnemec Company, Inc. warrants only that its coatings represented herein meet the formulation standards of Tnemec Company, Inc. THE WARRANTY DESCRIBED IN THE ABOVE PARAGRAPH SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. The buyer's sole and exclusive remedy against Tnemec Company, Inc. shall be for replacement of the product in the event a defective condition of the product should be found to exist and the exclusive remedy shall not have failed its essential purpose as long as Tnemec is willing to provide comparable replacement product to the buyer. NO OTHER REMEDY (INCLUDING, BUT NOT LIMITED TO, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, ENVIRONMENTAL INJURIES OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL LOSS) SHALL BE AVAILABLE TO THE BUYER. Technical and application information herein is provided for the purpose of establishing a general profile of the coating and proper coating application procedures. Test performance results were obtained in a controlled environment and Tnemec Company makes no claim that these tests or any other tests, accurately represent all environments. As application, environmental and design factors can vary significantly, due care should be exercised in the selection and use of the coating.

To: Andy Spencer, P.E.
American Fork City Engineer

From: John E. Schiess, P.E.
Senior Engineer

Date: March 23, 2015

Memorandum

Subject: Upper East 5 Million Gallon Culinary Water Tank Repair Options

Over the past several months we have been assisting the City in analyzing and evaluating the City's upper east 5 MG culinary water tank. The tank was constructed in 1980 and in recent years has been experiencing concrete spalling on the upper wall near the lid and exposed reinforcement on the roof. The construction method was "post-tensioned" which refers to reinforcement provided primarily by cables that are tightened after concrete is poured. This method uses considerably less concrete than a standard rebar reinforced concrete tank and can save a considerable amount of money if done correctly.

In order to evaluate the tank Horrocks Engineers contracted with Structural Technologies to inspect the tank and provide recommendations and cost estimates to repair the tank. Structural Technologies is a company that specializes in "post-tensioned" construction among other things and actually had purchased the firm VSL who originally designed the tank in 1980. They still had the original design in their files and staff familiar with the standard construction practices back then. They have actually assisted several communities in Utah and Colorado with repair of similar structures in the past couple of years.

Structural technologies provided the City a report detailing their inspection and recommendations dated 1-23-15. The report is attached for your review in which they identified two main items of concern. The main concern for the roof include not enough concrete cover over the "post-tensioned" cables with some cables exposed the weather. If these cables were to corrode and break the roof could collapse. The main concern for the walls was expansion and contraction of the tank lid causing the upper portion of the wall to spall. This was due to design details and construction practices that were common at the time but are not typically utilized today because of the issues noted here.

The two repair options include:

1. Option 1: Patch the roof with a waterproof membrane and patch the walls with concrete grout. This option is estimated to cost in the range of \$500,000 with an expected life of 20 years. The repairs associated with this option are considered temporary in nature and do not fix the underlying cause of the failures. The repairs are estimated to last 20 years but may fail sooner or later than 20 years.
2. Option 2: Remove and replace the roof completely while patching the upper portion of the walls with concrete. This option is estimated to cost in the rage of \$1,100,000 with an expected life of 40 years. This estimate includes additional work identified as beneficial by the City beyond the \$900,000 estimated by Structural Technologies. This repair is considered permanent in nature and addresses the underlying causes of the failure. The 40 year life span was determined based on the original 75 year design life of the structure minus 35 years since construction.

One significant unknown is the condition of the existing walls and floor and if there is an additional 40 year life in these areas of the tank. If there is a reasonable expectation of an additional 40 year life in them then it is a good investment to replace the roof. If not then the temporary patching may be the way to proceed. With this in mind Structural Technologies has obtained a cost estimate to have another company (SIMCO) test concrete samples from

the tank and give a professional opinion as to the remaining life of the floor and walls. It is estimated to cost in the range of \$30,000 to \$40,000 to obtain these additional results.

The question for the City to address is which repair option to attempt in order to prolong the life of the tank. The additional concrete testing may provide the comfort level necessary to proceed with the permanent fix or justify the temporary fix depending on the results.

CITY COUNCIL STUDY ITEM

City of American Fork
COUNCIL WORK SESSION
May 21, 2015

Department Public Works

Director Approval



STUDY ITEM Presentation and discussion on revisions to the 900 East 700 North Project.

SUMMARY RECOMMENDATION Staff recommends approval of the revised construction plan for 900 East. To avoid contractor delay charges, construction has continued per the new plan.

BACKGROUND As construction crews began to prepare for the construction on 900 East, it became clear that the plan as previously prepared had potential impact on the old growth trees near to 900 East to a point where the City Forester and City Parks Division were concerned regarding their ability to survive the construction. Staff then developed a substitute plan that provides equivalent parking and minimizes the damage to the existing trees. Exact budgets are currently being analyzed for the modification.

It is, however, anticipated that the construction project costs will be the equivalent to the existing budget; scope adjustments will be made as necessary to accomplish this goal. The construction has proceeded with the substitute plan. However, if there are elements the Council would like to incorporate into the plan, there is still time to make these additions.

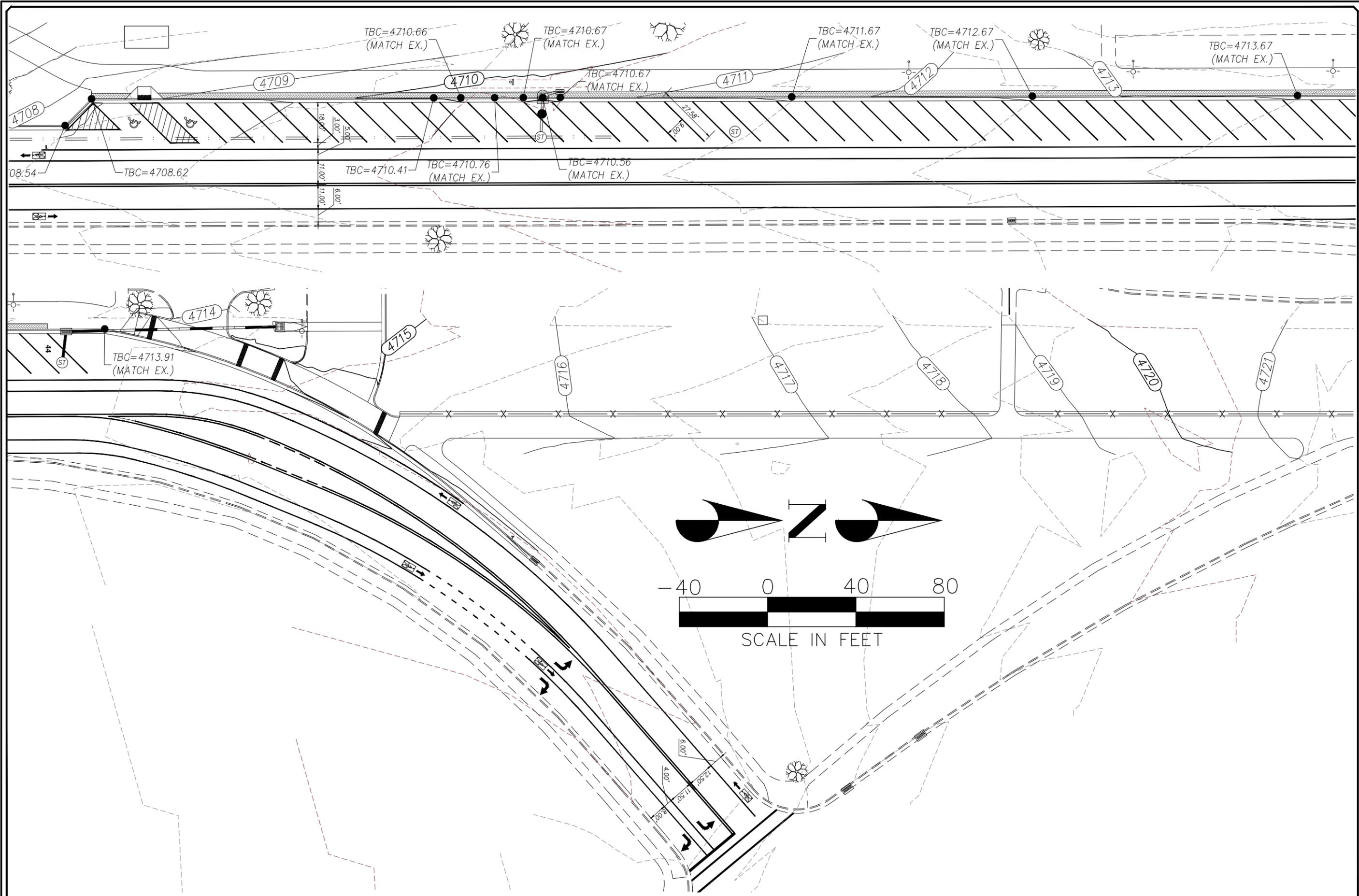
Many items such as the pavilion, tot lot, sidewalk extensions, flag pole, etc. will need to be constructed with a future project. The current project is seeking only to implement the roadway, parking, and trail improvements.

BUDGET IMPACT Exact project budget adjustments are being coordinated with the contractor currently. As such, final figures are not yet available.

ALTERNATIVES N/A

SUPPORTING DOCUMENTS

1. Concept Plans (2 sheets)
2. Grading Plans (2 sheets)



NO.	DESCRIPTION	DATE	APP'D.

ORIG. DATE: 4-30-15
 SURVEY BY: PEPG CREW
 DRAWN BY: RLK
 DESIGNED BY: RLK
 CHECKED BY: RLK
 SCALE: 1"=40'

PEPG CONSULTING LLC
 8805 S. SANDY PARKWAY • SANDY, UT 84070
 PHONE: (801) 562-2521 • FAX: (801) 562-2551
 CIVIL ENGINEERING • LAND SURVEYING • PROJECT MANAGEMENT
 GEOTECHNICAL • MATERIALS TESTING • INSPECTIONS

700 NORTH & 900 EAST
ROAD IMPROVEMENTS
 NEW CONCEPT
 PLAN
 PROJECT NUMBER: 6308.1210
 DWG. NUMBER: CONCEPT-01
 DRAWING FILE:

AM. FORK CITY

PRELIMINARY NOT FOR CONSTRUCTION

SHEET NO. **N/A**

CITY COUNCIL STUDY ITEM

City of American Fork
COUNCIL WORK SESSION
May 21, 2015

Department Parks and Recreation Director Approval 

STUDY ITEM Discussion regarding the replacement of the air structure over the swimming pool at the Fitness Center.

SUMMARY RECOMMENDATION Staff recommends replacing the “bubble” with a similar air structure. We have received 3 written bids on this project. One bid for a tensioned membrane structure and two air supported structures. The competition swimming pool is currently 22 years old. While it has held up incredibly well, it is projected that it will need to be replaced in about 8-10 years. The bubble system will provide a temporary permanent solution until there is a future upgrade. The best investment at this time will be an air structure.

BACKGROUND On Tuesday, April 14, 2015 American Fork City experienced high winds. During the wind storm, the air structure over the competition pool as well as the operating equipment were damaged and destroyed. The current bubble was in operation for about twelve years. The first bubble was in service for ten years before being replaced due to a defect.

While it is not the perfect system, the “bubble” provides this facility with the best of both worlds. A bubble allows for winter operations, and once removed, the view and the open air at the pool are amazing. The replacement will include a new structure, lights, ventilation system, doors, equipment and parts needed for operation.

The “Sprung” tensioned membrane structure was attractive to staff because of the stability and versatility. The building functions as a permanent structure that has doors around the outside that are able to be opened to allow fresh air and access to the outside. Moving to a more permanent structure would entail a more significant construction project, longer down time and a higher price tag. This is an attractive option for the future.

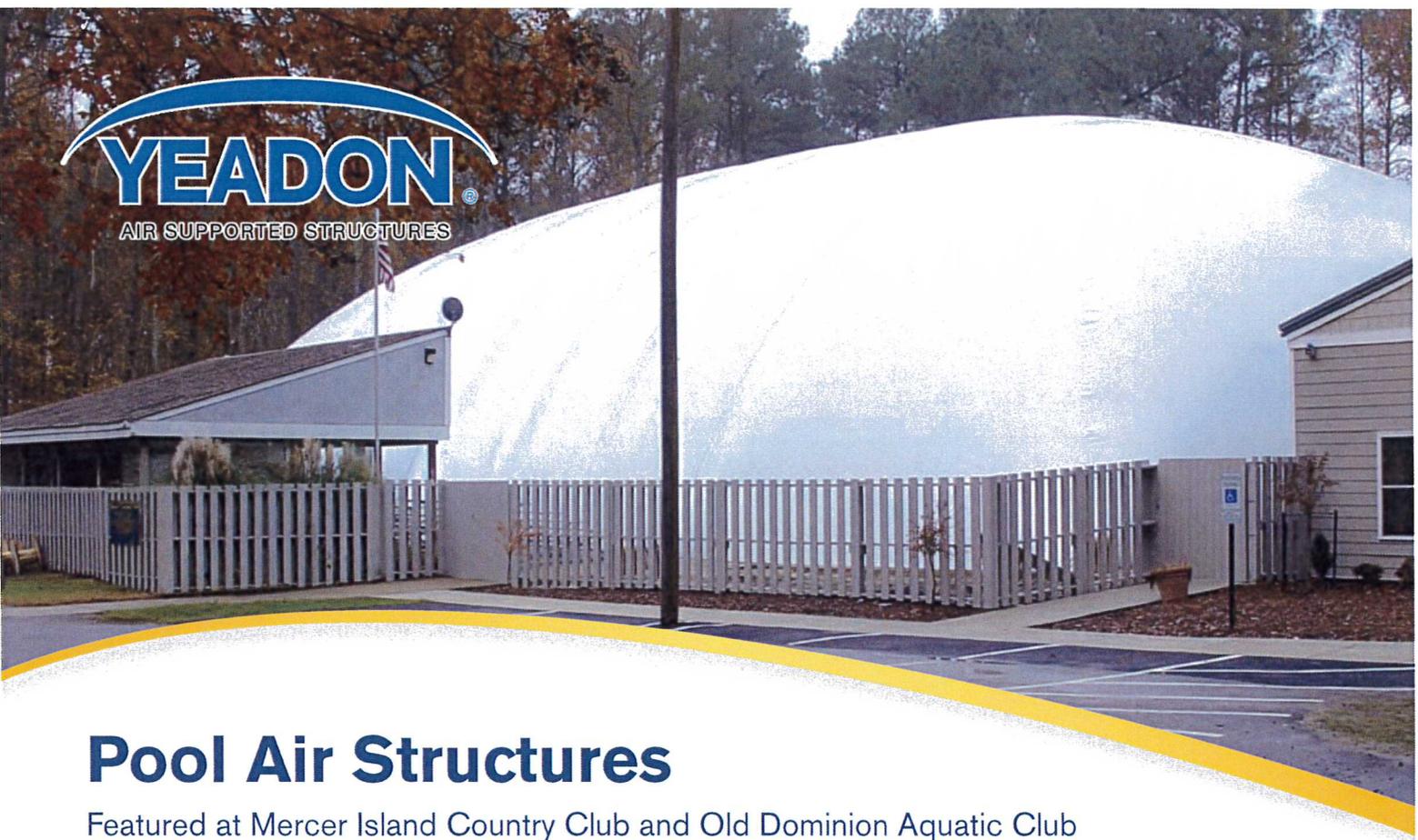
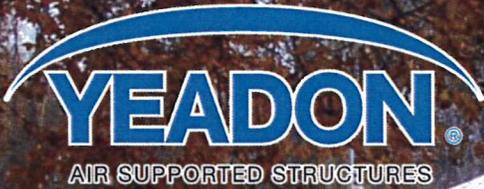
BUDGET IMPACT Insurance has reimbursed us so far in the amount of \$300,002.19. The total amount of loss submitted was \$407,379.66. The loss included \$42,000 in other equipment that is being replaced. The current replacement costs for just the bubble are estimated to be:

- -Option A: Yeadon Structure: \$ 373,500 + \$42,000 = \$ 415,500
- -Option B: ARIZON Structure: \$ 302,211 + \$42,000 = \$ 344,211
- -Option C: “SPRUNG” Structure: \$2,956,000 + \$42,000 = \$2,998,000

The past structures have been from Yeadon. We are doing research on ARIZON. Staff is anticipating this would need to be funded out of surplus. Staff contacted specific vendors that are in the industry and we know can provide the quality of product we are seeking. We did not go through a formal bid due to the emergency replacement needed; as a time saving measure we are requesting to use the information we have obtained. Production time is 12-14 weeks and the order would need to be placed soon to get it here in time for the fall operations.

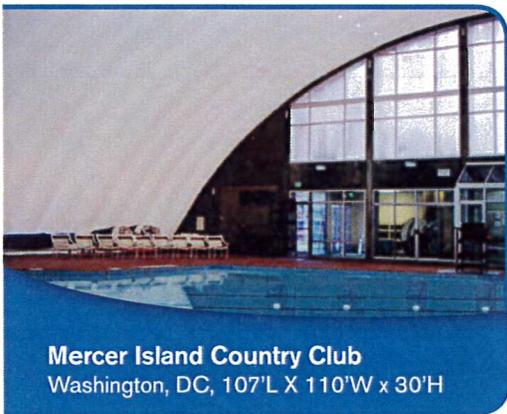
ALTERNATIVES Do not provide a replacement structure and close the pool in the winter. Staff has not evaluated what the operational savings or revenue losses would be.

ATTACHMENTS Information on three alternative structures for the pool enclosure

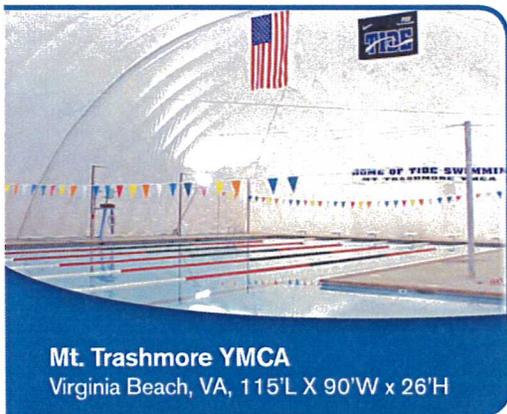


Pool Air Structures

Featured at Mercer Island Country Club and Old Dominion Aquatic Club



Mercer Island Country Club
Washington, DC, 107'L X 110'W x 30'H



Mt. Trashmore YMCA
Virginia Beach, VA, 115'L X 90'W x 26'H

Yeadon® is the industry leader in high quality air-supported structures for pools. Our pool domes can be used in virtually any climate condition.

Over 30 years experience constructing quality Air Supported Structures for sports, industry and construction, have earned Yeadon® its reputation as the industry leader. Our state-of-the-art energy efficient structures incorporate the latest innovations in design, anchoring, mechanical, electrical and proprietary control systems.

Features of Yeadon® structures include: Yeadon's® Aluminum Base Attachment Channel that is cast into the concrete beam for a quick and easy put-ups and take-downs, high profile sidewalls for maximum headroom, high gloss 16oz inner liner, highest quality doors, modern reflective lighting systems, with the industry leading computerized controls for maximum energy efficiency and ease of maintenance.

Yeadon's® customer list of pool domes users includes many of world-class clubs. Some of our applications include Brown University, Hilton Head Island Recreation Center and Mercer Island Country Club. Our pool structures can be found worldwide because Yeadon® can meet the most demanding needs and specifications.

Standards:

Yeadon® structures meet and exceed industry standards, including Air Structures Design and Standards Manual ASI, ASCE, CSA, CAN-S109 and NFPA 701.

Technical Support:

Design, construction advice, specifications, preparation of tenders and bids, and a 24 hour hot-line service, are all part of Yeadon's® services.



YEADON

AIR SUPPORTED STRUCTURES

Pool Air Structures

Specifications:

- **Clear Spans:** up to 360' (110 meters) wide, by any length
- **Outer Fabric:** 28oz and 32oz per square yard, high quality, high tensile, flame resistant, PVC coated, polyester fabrics are available as translucent or opaque with a 10-year pro-rated fabric warranty.
- **Finishes:** Standard acrylic or Arkema Kynar® protective coatings are available. Kynar® coated products have a 15-year pro-rated warranty.
- **Inner Thermal Acoustic Membrane:** 16oz/sq yd. high strength PVC coated polyester fabric with Yeadon® high gloss finish, in white.
- **Mechanical Systems:**
 - **Furnace/Inflation/Standby** – Yeadon® features our ALL-IN-ONE combination mechanical unit, custom designed, quiet, supplied with stainless steel heat exchangers, ETL and CGA approved, complete with remote station controls to operate and maintain the structure, may be designed for underground ducts or direct discharge.
 - **Standby Units** – incorporate built-in or secondary fan systems for low pressure, with a separate engine-driven fan for power failure emergencies.
 - **Air Cooling Units** – designed for specific site conditions are available as an option.
 - **Controls** – The Wind Sensor, Snow Sensor, and Full Automation Control is the most advanced automatic control available. It uses modern computerized controls for interior pressure, heating, and monitoring.
- **Base Channel:** Yeadon® exclusive extruded and anodized aluminum channel is cast into concrete grade beams which ensure a virtually airtight low cost attachment of the structure to the concrete.
- **Doors:** Heavy-duty, high quality, and preassembled exit doors, revolving doors, car and pedestrian air lock door units are available. They all come complete with exit lighting and hardware.
- **Lighting:** Yeadon's® high intensity metal halide indirect lighting systems utilize the most efficient optical reflectors to provide maximum lighting uniformly inside the dome. The fully faceted, heavy duty, impact resistant, glass finished optical assemblies provide energy efficiency with maximum levels of illumination and minimum maintenance.

Website:

www.yeadondomes.com

Email:

info@yeadondomes.com

CANADA

Toll Free: 1-888-493-2366

Yeadon Fabric Structures, Ltd.

Phone: 519-821-9301

Fax: 519-821-9010

UNITED STATES

Toll Free: 1-800-493-2366

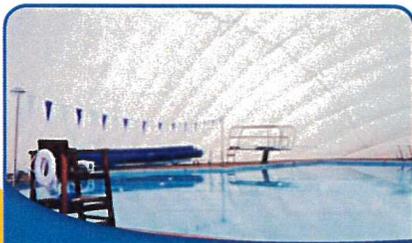
Yeadon Fabric Domes LLC

2475 Maplewood Drive, Suite 114

Maplewood, MN 55109

Phone: 651-633-7400

Fax: 651-633-2019



Mercer Island Country Club
Washington, DC, 107'L X 110'W x 30'H



Old Dominion Aquatic Club
Chesapeake, VA, 135'L X 111'W x 34'H

Arizon Swimming Pool Domes

Cover an existing outdoor pool this winter

Your outdoor pool is useless in winter! Cover your pool with a custom-designed Arizon Structure to offer indoor swimming all year.

Are you letting potential revenue go down the drain? Cover your existing pool with an Arizon dome so that you are open for business when the snow starts to fall. Your swimmers will enjoy heated, naturally-lit indoor swimming at a fraction of the cost of constructing an indoor brick-and-mortar pool. Domes offer the flexibility of both indoor and outdoor options, as your pool can easily be dismantled in time for Memorial Day weekend.

An energy-efficient and affordable way to bring the outdoors inside

Arizon is the **only** manufacturer to provide its own mechanical equipment- specifically designed for operating air structure. Serving as just one of several energy-efficient options we offer, our mechanical equipment helps offset operating costs and reduces your business' carbon footprint.

We are a total solution partner and take care of our clients' concerns well beyond the initial installation. Our service department provides 24-hour emergency service and maintenance for all air structures and their mechanical components.

Year-round pool domes have many benefits, including:

Flexibility

Pool domes are often used to convert outdoor pools to heated, indoor pools for the winter months. Extend your facility offerings this winter with an Arizon pool dome.

Comfort

Provides the ideal temperature conditions for swimmers, as well as natural lighting to bring the outdoors inside.

Energy Efficiency

Minimizes operating costs by providing natural light produced by translucent fabric, and low heating & inflation costs with Arizon's HVAC system.

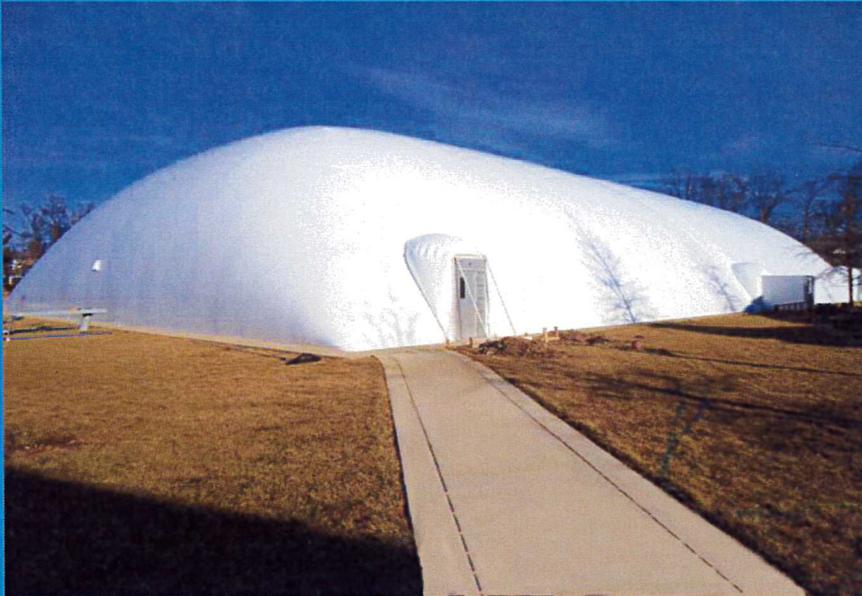


Case Study

Aquatics

Blairwood Tennis, Swim & Fitness

Louisville, KY



Project Specifications

Type/Application

Aquatics Dome

Facility Size

115'W x 200' L (23,000 sq. ft.)

Features/Highlight

Seasonal Facility

Energy Efficient Skylight System

Arizon's Energy Efficient Mechanical System

Pool Tarp

Blairwood Makes Big Splash with Seasonal Dome!

Challenge

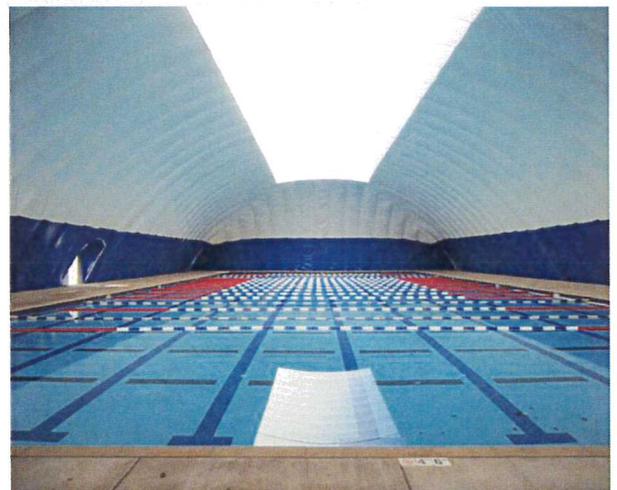
Provide a multi-functional, clear-span, seasonal air structure for Blairwood Tennis, Swim and Fitness in Louisville, KY, despite various obstacles throughout installation. Blairwood Tennis, Swim & Fitness is a premiere, family oriented club that wanted to convert their 50 meter pool into a year-round facility.

Arizon Solution

Arizon designed, manufactured, and installed a climate-controlled air supported structure in Louisville, KY. The 23,000 sq. ft. aquatics dome fits over a large pool. The structure include's an energy efficient mechanical system, and an interior skylight that runs the length of the dome.

Result

Before the dome was completed, Blairwood Tennis, Swim & Fitness members had to drive to indoor swimming facilities in other areas during unfavorable weather. With the new addition of the Blairwood air structure, the community can host swim meets, practices, and general recreational activities for their members. Their 50 meter pool can now be used to its full advantage, rather than sitting idle for 1/2 the year.



ARIZON[®]

STRUCTURES

Case Study

Aquatics

Scioto Country Club

Columbus, OH



Project Specifications

Type/Application

Aquatics Dome

Facility Size

74'W x 99' L (7,326 sq. ft.)

Features/Highlights

Fabric Vents for high-moisture applications
Designed for seasonal installation/dismantles

Translucent fabric for a 'bright'
interior that utilizes natural lighting

It's always swimming season at Scioto Country Club

Scioto Country Club is Rich in History

Scioto Country Club was originally founded in 1916. The country club is a member of an elite group that hosts major championships including the U.S. Open, the Ryder Cup, the PGA Championship, and more. Arguably one of the top golf courses in the country, Scioto Country Club is also well known throughout the local community as an important gathering place for family and friends, a treasured part of the history of central Ohio, and a home away from home. A young Jack Nicklaus honed his game at the well-known club in the very early days of his career, and eventually transformed into who is arguably the most successful golfer of all time.

Challenge:

Provide a seasonal dome for a swimming pool at one of the most elite country clubs in the country with a quick turnaround time. The pool also had very limited deck spacing available for the extrusion.

Solution:

Arizon provided a seasonal swimming facility for the Scioto Country Club while working on a tight deadline and fast-tracked schedule. The energy-efficient components provided to the Country Club are an added benefit. The service provided by Arizon helped forge a long-lasting relationship between Scioto Country Club and Arizon.



ARIZON[®]

STRUCTURES

Arizon Mechanical Systems

Arizon's inflation, heating, air conditioning, ventilation & emergency HVAC systems are up to 7 times more energy efficient than competitors' systems. Arizon is the only air structure manufacturer in the industry that supplies and services its own mechanical systems.

Green Friendly

Arizon's mechanical systems are the most energy-efficient equipment in the industry, translating into significant operating cost savings for air structure owners.

Arizon's equipment uses a 5-7 hp motor, as compared to competing equipment that uses 50 hp motors. This results in a 40-70% reduction in energy usage, which costs a lot less to operate.

Our company's proven & patented Air-Rotation® technology evenly distributes heat in the space- corner to corner- and reduces the heat loss through the dome by pulling heat down from the roof before it is lost. This also helps to reduce operating costs and provides a better, more comfortable environment in the dome.

*Ask about our premium sound packages, angled discharge, air filters and premium insulation.

Specifically Designed for Air Structures

Arizon is the only company in the industry that designs and services its own inflation equipment, which is manufactured specifically for use in air supported structures. Our above-ground, direct-to-fabric connect systems eliminate the need for any underground ductwork, which reduces construction and installation costs significantly.

Energy Efficiency Offsets Operating Costs

Arizon's equipment uses a lower horsepower motor and patented Air-Rotation® technology, making it the most energy efficient inflation equipment in the industry- this translates into significant operating cost savings.

Warranty

Our systems carry a 1-year warranty, which is the industry standard warranty on mechanical systems.

Air-Rotation® Technology

Our UL® -listed systems incorporate our company's patented Air-Rotation® technology, which reduces fuel costs and evenly heats and cools the structure from top to bottom.

Back Up Generator

All of our mechanical equipment is supplied with self-testing back-up generators that are designed to automatically kick in if there is any interruption of service that causes a power failure to the primary and auxiliary inflation equipment.

Programmable Logic Controls

Our systems feature electrical programmable controllers with a built-in 7 day schedule for night setback of temperature. Optional wind and snow sensors are available upon request for additional control, safety and functionality.

Feature

- Air-Rotation® Effect
- Programmable Logic Controller
- 7-Day Night Setback Schedule
- Available Wind & Snow Sensors
- Variable Frequency Drive Motor Control
- Total Stainless Steel Heat Exchange
- Direct Drive Fans
- Heavy-Duty Double Wall Construction
- Start-Up, Adjusting & Training Included
- Service, Maintenance & Repairs by Arizon
- Reliable Generator Tests Itself Weekly

Benefit

- Even temperatures throughout, lower operating costs
- Reliable functionality
- Lower operating costs & less hassle
- Automatic weather response; peace of mind
- Lowest possible electric costs
- Longest life, lowest maintenance
- No belts; Much less maintenance
- Strongest, longest life units available
- Delivered completely
- One call, no hassles
- Maintenance man can take a vacation day

Arizon Skylight System

Arizon's high-tech skylight system uses a combination of fabrics to provide natural lighting and provide a moderate amount of insulation, which offsets overall operating costs and increases energy efficiency.

Arizon's skylight system allows natural light to enter the dome during daytime hours, minimizing the need for interior lights to be on during the day and resulting in significant operating cost savings. The size of the skylight can be designed to meet needs and design specifications.

Offset Lighting Costs

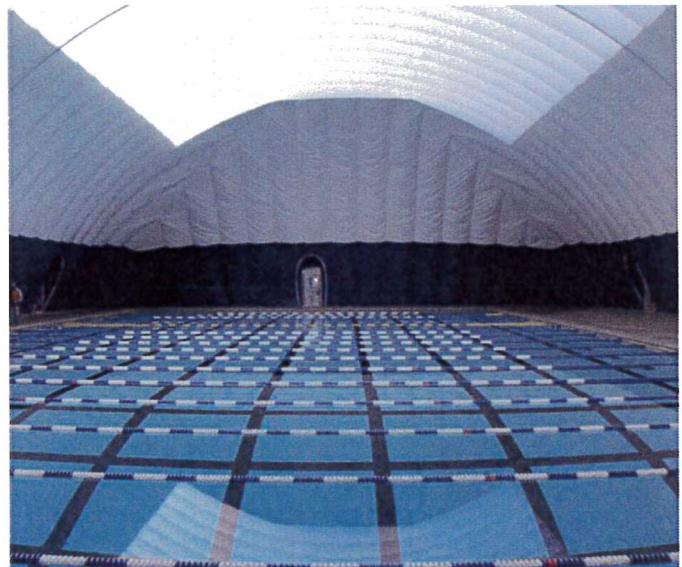
Arizon's high-tech skylight system allows natural lighting into the dome during daylight hours, limiting the need for artificial light usage during the day. This will offset your operational costs.

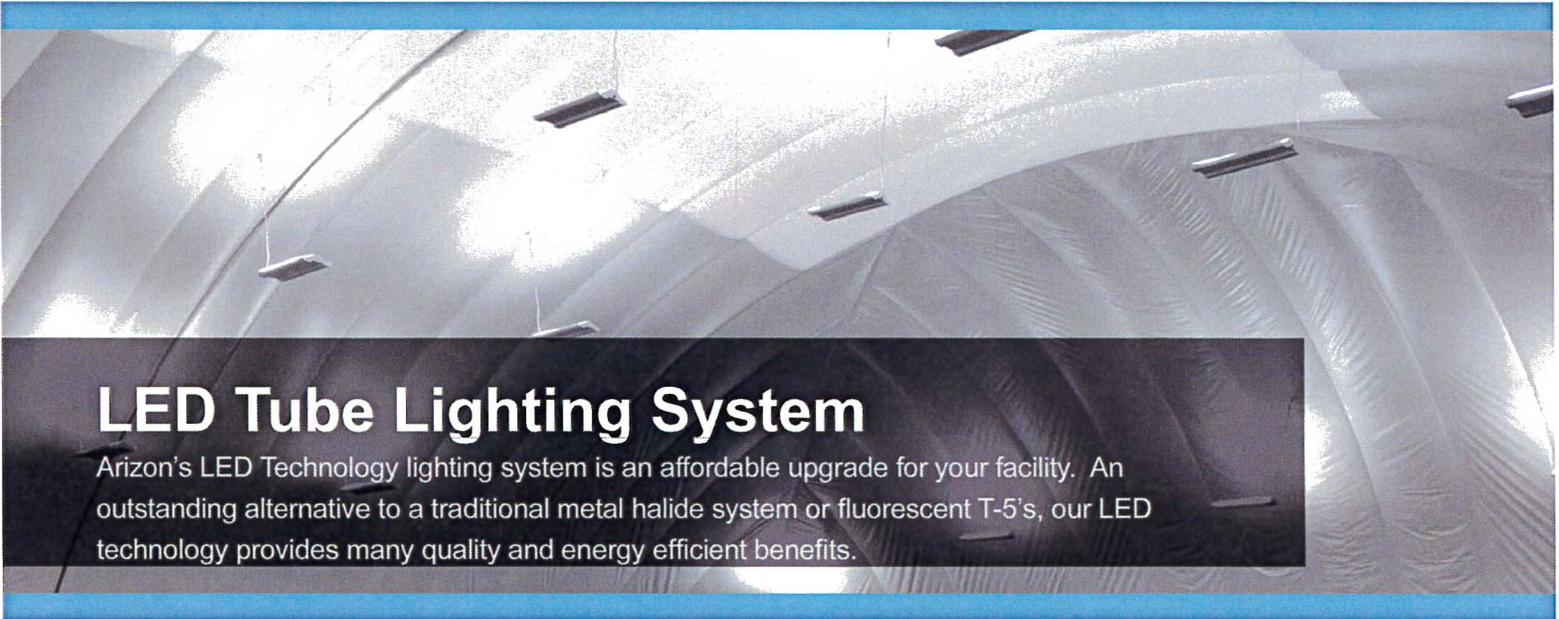
Aesthetically Pleasing

Arizon's skylight option provides aesthetically-pleasing design option, while providing pleasant indoor lighting all day- even on cloudy or overcast days.

Saves Energy

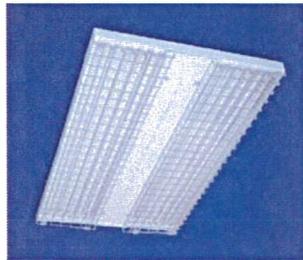
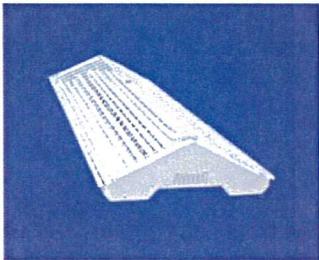
Using a combination of opaque and translucent fabrics, Arizon's skylight system provides a "best of both worlds" approach to choosing a fabric option. The opaque fabric helps insulate the dome effectively reducing heating/cooling costs, while the translucent fabric provides pleasant, natural light.





LED Tube Lighting System

Arizon's LED Technology lighting system is an affordable upgrade for your facility. An outstanding alternative to a traditional metal halide system or fluorescent T-5's, our LED technology provides many quality and energy efficient benefits.



Driverless Technology
eliminates ballasts & drivers- providing the

**Highest.
Possible.
Efficiency.**

Description The unique driverless design enables the use of an enhanced heat sink system, producing advanced thermal management capabilities, thus eliminating long term color shifts and increasing lifespans to 65,000 hours. For more information contact your local sales representative to discuss ordering options.

Benefits LED tubes fit directly into existing T-5 fixtures, which provides a valuable solution. LED tubes lead to unprecedented energy savings, drastically reduced re-lamp frequency, and a high quality of life with long-lasting performance. LED tubes yield inspiring returns on investment. For more information contact your local sales representative to discuss Total Cost of Ownership.

Specifications

- Wattage per tube: 26 Watts per tube
- Wattage per fixture: 312 watts per fixture
- Lumens per watt: 131
- Lumen Depreciation & Color Loss: 5% over lifetime
- Average Lifespan: 65,000 hours
- Sizes Available: 2' to 8' tubes
- Color Rendering Index: 93+
- Operating Environment: Damp & Dry
- Operating Temperature: -30 degrees F - 130 degrees F
- Lens Cover: Clear or Opaque
- Replacement: 1 for 1 direct replacement of T-5 Fluorescent
- Mercury Concentration: None

Performance While yielding high energy savings, LED technology tubes last 2-3 times longer than fluorescents while retaining their brightness. Equivalent to a day one fluorescent light, LED's provide an adjustable light angle to ensure an even distribution of light. **This design produces the breakthrough 131 lumens per watt light output- double that of most other lighting options.**

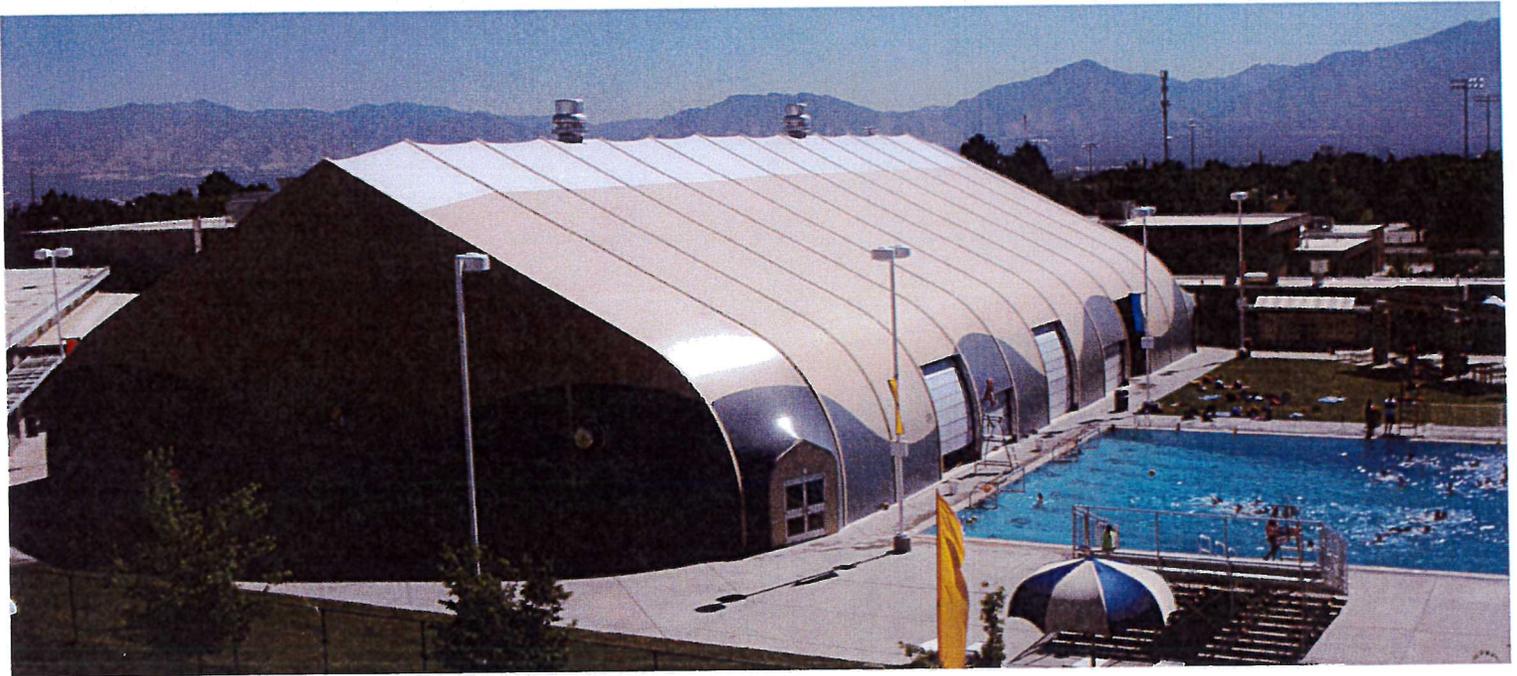
Accessories Reduced energy consumption, Instant on/off, warranty, vibration and impact resistant, 1 for 1 direct replacement, installation energy rebates. The LED tubes will significantly reduce energy consumption while replicating the light levels at lower wattage per tube & fixture. Check with your local energy provider to find out how many rebates you qualify for.

Compliance UL listed - E359950 (UL 1598C Compliant)
FCC Certification- WT11073957-D-E-F
DLC- TLT8G5X4F
CE- N8 12 12 77835 004
ROHS- DGC11100915SE
ISO- 14001: 2004, 9001: 2008

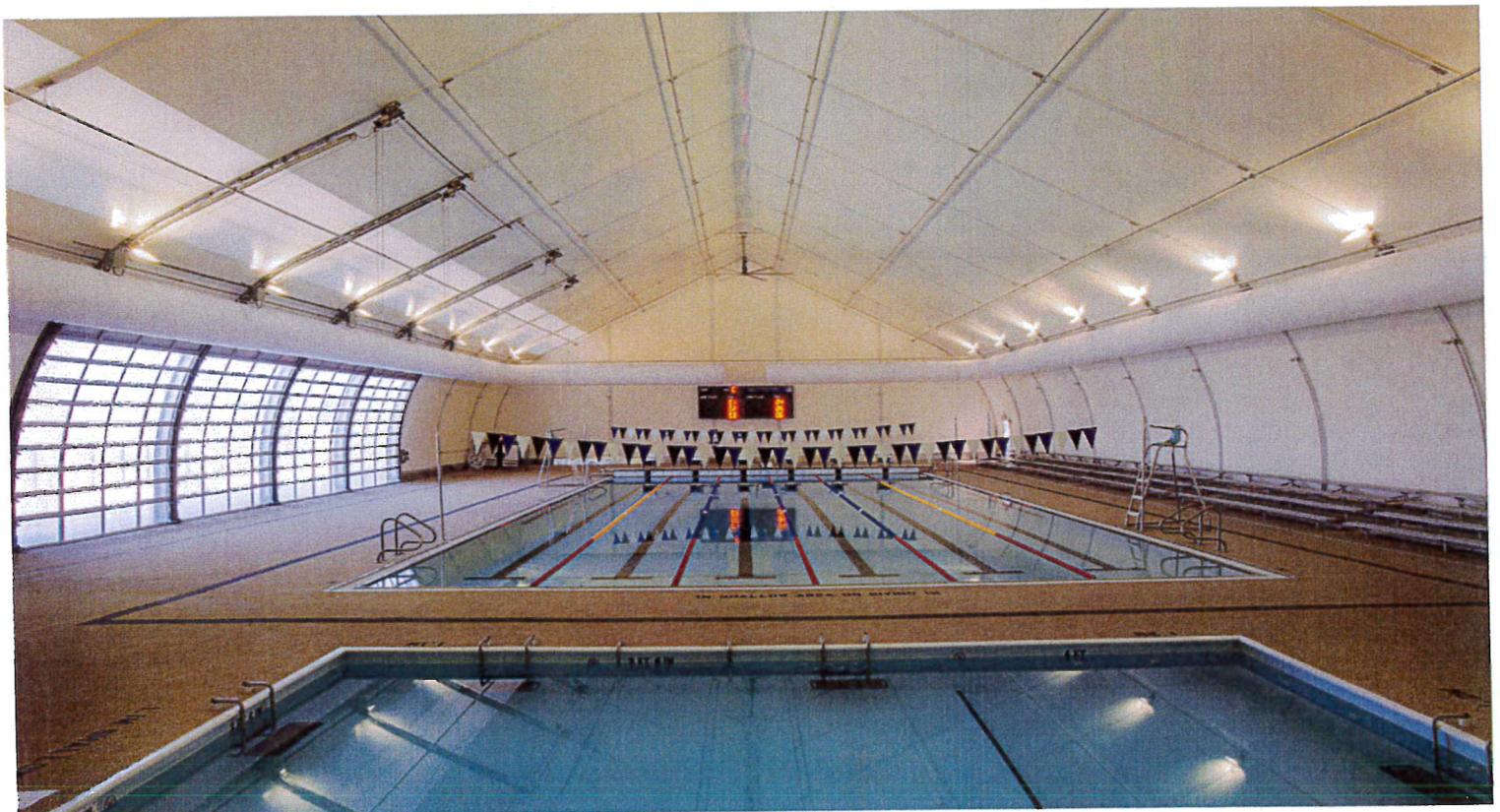


Sprung
Since 1887

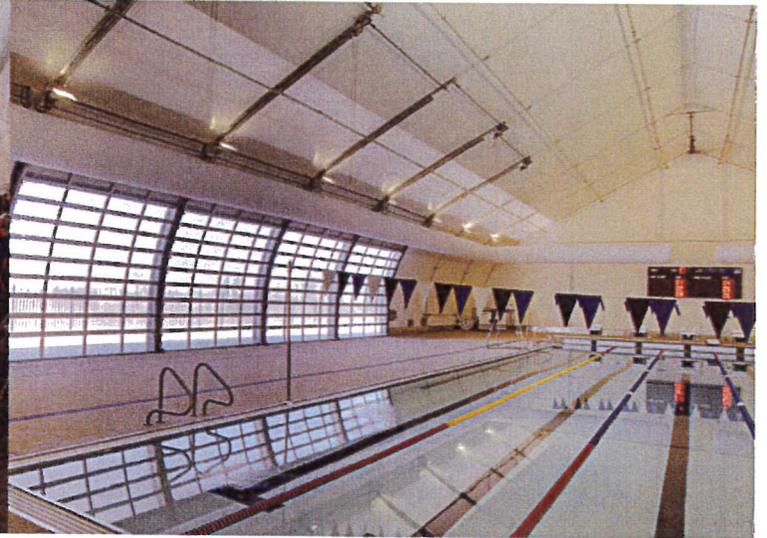
Engineered Performance Community Pool Enclosures



Converting your existing outdoor pool into a year round performance aquatic facility is easy utilizing Sprung structure technology!!!



Engineered Performance Community Pool Enclosures



Kearns Oquirrh Park Fitness Center 50 Meter Olympic Sized Pool, Utah

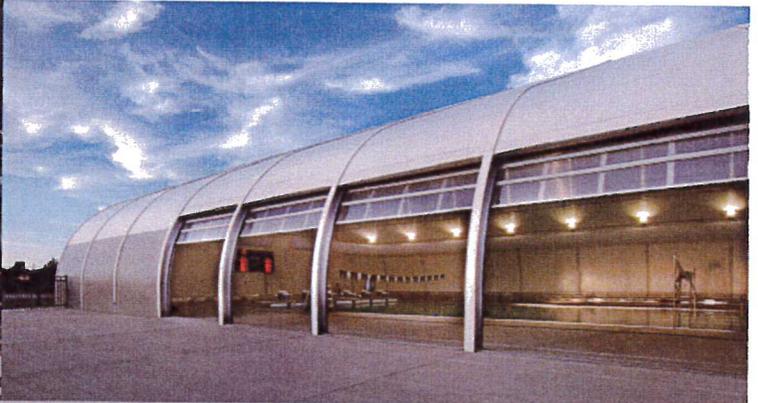
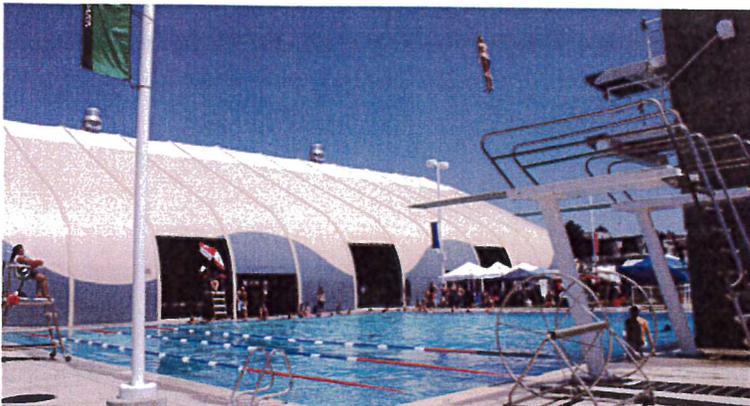
Enclosed an outdoor 50 meter Olympic sized pool. Daylight panels along the peak and seasonal sunshine doors add optimum amount of natural daylight. The R30 encapsulated insulation ensures climate control.

Sprung worked closely with Kearns to help design a year round facility that would give the feel of a conventional facility with the atmosphere of an indoor/ outdoor pool. This was achieved by introducing the translucent Sunshine doors and the Kalwall Architectural Panels that raise up allowing the visitors to walk in or out.

Centennial Aquatic Centre Collingwood, Ontario

The outdoor pool in Collingwood, Ontario, was built in 1967 and in 2013 was enclosed with a new high-tech Sprung structure, allowing it to be used year-round.

The pool is 25m long by 12m wide, with a water capacity of 540,000 liters. A 90' wide x 210' long Sprung structure was erected in a 6 month time frame and features a specially designed pool insulation system that performs extremely well in high humidity environments, while translucent daylight panels and sunshine doors add natural daylight to enhance the swimming experience.



A Better Way to Build

Immediate Delivery:

Typically ships within 2 weeks from firm order.
2 million square feet in inventory.

Optional Insulation Package:

Superior performance R28 Johns Manville fiberglass blanket insulation.

Limited or No Foundation:

If concrete pad not required, most structures can be erected without foundations. Pre Engineered widths 30' - 200' by any length.

Expandability:

Modular in design makes it easy and economical for future expansion.

Relocate-ability:

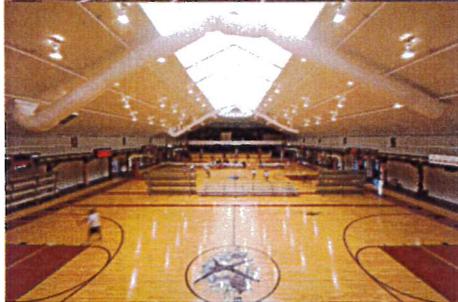
Easy and Economical to dismantle and relocate after use.

Resale-ability:

Structures can easily be resold and relocated, recapturing a percentage of your investment.

Lease-ability:

Free up capital. Lease/rent up to 5 years.
45-70% of lease payments credited towards purchase, depending on term of lease.

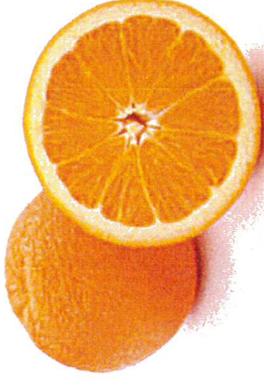


SPRUNG VS. PRE-ENGINEERED METAL BUILDINGS

Oranges vs. Oranges

How does a Sprung structure really compare?

When you compare feature by feature, you'll quickly see how your Sprung structure out-performs pre-engineered metal buildings. Quality starts with intelligent design and choice of materials. When you consider the rapid construction time, superior energy efficiency, long term flexibility and lower overall costs, you'll agree that a Sprung structure is the right choice.



FEATURE	SPRUNG STRUCTURE	PRE-ENGINEERED METAL BUILDING	CONVENTIONAL CONSTRUCTION
Engineering	Structures are engineered to meet hurricane force winds and by design shed snow	Can be designed on a case by case basis	Can be designed on a case by case basis
Delivery	Available immediately from inventory from our West Jordan, Utah manufacturing and distribution center. A Sprung structure can generally be ready to ship within three weeks from receipt of order.	6 - 8 weeks	2-4 months
Foundation Requirements	Provided appropriate soil conditions exist, foundations are not required on structures up 160' wide	Foundations required	Foundations required
Construction Time	Structures can be erected at a rate of up to 1000 sq ft per day. Sprung structures can be erected much faster than metal or conventional construction. An entire project can be completed in 1-4 months from start to finish.	9 - 12 months	Minimum 1 year
Insulation	Continuous 8-inch thick R25 insulation from ground to peak. Johns Manville formaldehyde free fiberglass insulation. (9-inch R30 on 100' to 200' wide structures)	6-inch R20 wall squeezed to R14, 6-inch R20 roof squeezed to R11	R20 wall R20 roof
Lighting Levels	The highly tensioned white interior membrane reduces number of light fixtures required	Requires more lighting fixtures	Requires more lighting fixtures
Maintenance Schedule	Aluminum substructure is virtually maintenance-free Self-cleaning exterior architectural membrane	Standing seam metal roof prone to large thermal movements and requires continuous maintenance, especially at penetrations	Regular maintenance is required
Flexibility to Relocate	Yes	No	No
Airtight Building Envelope Efficiency	Air Permeability almost 0', which means excellent energy performance	Poor airtightness	Moderate airtightness
Energy Savings And Operating Costs	Up to 20% energy savings over pre-engineered metal buildings	Moderate energy performance	Moderate energy performance
Natural Light	A translucent section of skylight membrane provides the optimum amount of natural light. Balance of the structure includes an opaque membrane that prevents solar gain which provides climate control during summer and winter months	Not available	Costly addition
Acoustics	Excellent acoustics properties with our comprehensive insulation package and "soft wall" interior membrane	Significant additional costs associated with acoustic treatments needed to make a metal building acceptable for any application were acoustics are a concern (gymsnasiums, public assembly, churches, casinos, offices etc.)	Limited performance
Lifespan	60+ years	60+ years	60+ years
Guarantee	30 years on aluminum substructure, up to 20 years on architectural membrane	Limited warranty	Limited warranty
Service	Established in 1887, Sprung has over 250 employees ready to assist a moments notice	Available	Available
Proven Technology	12,000 structures erected in over 90 countries worldwide	Wide range of product	Wide range of product



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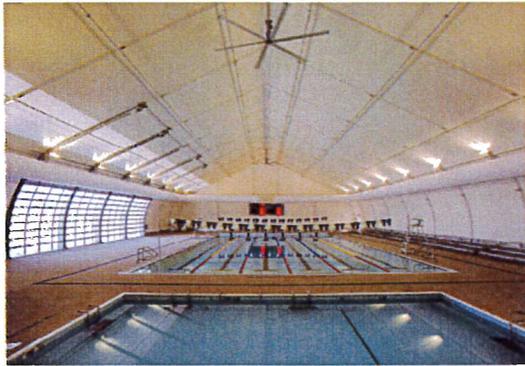
VAN BOERUM
& FRANK ASSOCIATES, INC.
CONSULTING ENGINEERS

40+
YEARS

Performance Community Pool Enclosures

Sprung & VBFA Pool Enclosure Opportunities

When the weather is ideal, you cannot beat the fun and enjoyment of swimming in an outdoor pool. However, after the summer is over, the temperatures get colder, the dark clouds develop and often rain or snow is in the forecast. An outdoor pool soon gets abandoned and everyone heads to the nearest indoor pool to continue the fun.



Collingwood Swimming Pool, Canada

Indoor pools have the advantage of being weather independent and they can generate valuable revenue all year round. However, some indoor pools are darkly lit, they have a strong smell of chlorides and the ventilation is typically very inadequate and eye watering. The walls and ceilings can have condensation and dripping problems. Any metal inside the pool may appear rusty and corroded.

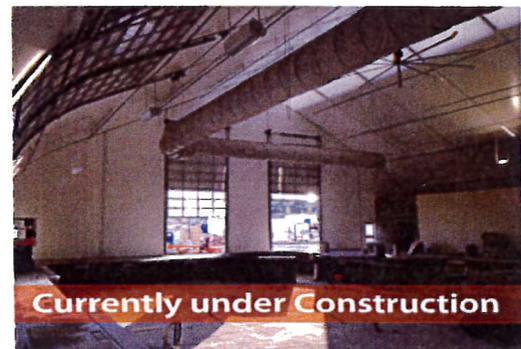
Some outdoor pools are covered with an inflatable, air supported bubble during the colder seasons. These interiors feel like a cave and they require a tremendous amount of energy to keep the bubble inflated and heat the space. These types of products are historically expensive to maintain and are unreliable.

Sprung Structures has over 40 years of experience with 12,000 structures in over 100 countries worldwide and a very innovative approach to solve these problems. They have developed a very high-quality, solid aluminum frame supported substructure that carries a 30 year pro-RATA guarantee. The self-supporting, clearspan design is available in widths from 30' - 200' wide by any length. Sprung structures are strong, durable, and energy efficient. By using numerous, large overhead style doors, the outdoors are brought inside when the weather is nice. Sprung incorporates translucent daylight panels in the roof to bring in natural daylight and give the pool a bright atmosphere which provides a significantly better swimming environment.

The Sprung architectural membranes have been proven to be an ideal material for a swimming pool environment. Gone are the brick and metal surfaces that are so susceptible to the condensation and corrosion problems. The tensioned membrane provides a clean, corrosion resistant surface that will last for the life of the pool. It has a 20 year pro-RATA guarantee and unlimited color choices. Fabric HVAC ducts constructed of 100% polyester can also be used to continue the clean, corrosion resistant theme inside the pool enclosure

An indoor pool requires a well-engineered HVAC system to keep the swimming pool comfortable and inviting. A proper HVAC and electrical design is absolutely crucial for creating the best indoor environment. The proper engineering for the heating, cooling, ventilation, humidity and de-humidification systems is critically important for a satisfactory indoor pool. Proper corrosion control, condensation control and preventing space stratification problems are all vital to any design.

The engineers at VBFA have many, many years of experience with the engineering and design for the HVAC and electrical systems for swimming pools. We understand the needs for humidity control and proper ventilation. We can evaluate the suitability of the building envelope construction and the pool water chemistry. The engineers at VBFA understand the importance of making the proper material selections to ensure that the materials are suitable for swimming pools. We have years of experience addressing the energy considerations of pools and have designed energy recovery and solar water heating systems.



Phillip S. Miller Park, Castle Rock, Colorado



VAN BOERUM
& FRANK ASSOCIATES, INC.
CONSULTING ENGINEERS

40+
YEARS

Performance Community Pool Enclosures

Sprung's high quality, corrosion proof, aluminum substructure, encapsulated pool insulation, and mold and mildew resistant membranes are ideally suited for swimming pool environments. By combining the high quality, corrosion resistant benefits of a Sprung enclosure with a properly engineered HVAC and electrical systems by VBFA, an outdoor pool can be converted to a year round facility that still retains the enjoyable atmosphere of the outdoor pool. At VBFA we have enjoyed working with Sprung structures on these interesting projects that extend the usefulness and enjoyment of the swimming pool facility.



Kearns Oquirrh Park Fitness Center

"Working closely with Sprung Instant Structures, and Van Boerum & Frank Associates, Inc., (Consulting Engineers), this pool is now operated on a year-round basis which has significantly enhanced the programs, activities and events we offer during the winter months."

Brent Sheets
Kearns Oquirrh Park Fitness Center



Kearns Oquirrh Park Fitness Center



Kearns Oquirrh Park HVAC System

Van Boerum & Frank Associates (VBFA)

VBFA has a wide range of experience in the design of aquatic centers, swimming pools, recreation centers, ice rinks, multi-purpose and other sports facilities. Our engineers have practical knowledge with heating, ventilating, humidity control, corrosion control, condensation control and other pool enclosure special requirements. They have a broad range of energy efficiency and conservation experience which they will be able to apply to any project. We have provided the engineering for a variety of new and remodeled facilities.

Swimming Pool Experience

- Kearns Oquirrh Park Fitness Center, Kearns, Utah
- Cottonwood Heights Recreation & Aquatic Center, Cottonwood Heights, UT
- J.L. Sorenson Recreation Center and Natatorium / competition-sized indoor swimming pool with eight lanes; an indoor leisure pool with slides, a lazy river and water play equipment
- Northwest Community Center and Pool Building, Salt Lake County
- Southern Utah University Sorensen P.E. Physical Education Building (includes Olympic-size indoor pool), Cedar City, UT
- Steiner Aquatics and Ice Center (indoor aquatics, weight and fitness rooms, two ice skating rooms, locker rooms), Salt Lake City, Utah
- Weber State University Physical Education Building, Ogden, Utah
- Grand County Recreation and Aquatics Center, Moab, Utah
- Uintah Recreation and Aquatics Center, Vernal, Utah

VBFA / Office Locations

Van Boerum & Frank Associates is based out in Salt Lake City, Utah. Branch offices are located in St. George and Logan, Utah, and Tempe, Arizona. For more information about how we can provide services in your area, please contact:

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Sprung Structures

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