Bethlehem Township
Northampton County Pennsylvania

DESIGN DEVELOPMENT REPORT

RENOVATIONS AND IMPROVEMENTS
TO THE
BETHLEHEM TOWNSHIP COMMUNITY CENTER

APRIL 15, 2016

ENTECH

PROFESSIONAL:
ENTECH ENGINEERING INC.
201 PENN STREET
P.O. BOX 32
READING, PENNSYLVANIA 19603
TELEPHONE: 610-373-6667
WWW.ENTECHENG.COM
ENTECH PROJECT #: 4610.01

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1.0 INTRODUCTION

1.01 SUMMARY

Entech Engineering is contracted by Bethlehem Township to provide professional services related to the renovations and improvements to the Community Center. The scope of work related to the necessary renovations and improvements was addressed in Architectural Furst's "Building Investigation Report" dated September 23, 2013. In addition to the renovation and improvement recommendations from the 2013 report, Entech has included additional items that the Township may wish to consider.

The information contained with this report is based on the following:

- Review of Architectural Furst's "Building Investigation Report", dated September 23, 2013;
- Review of the original construction documents, which include the construction drawings, technical specifications, product data, and shop drawings;
- Multiple site visits to the Community Center for site observations;
- Communication with multiple project representatives to discuss the existing materials' potential failures and potential replacement materials for the renovation.

The following projects have been organized into architectural, mechanical, and finally lighting projects. All of the projects include a brief narrative stating a noted deficiency, the recommended solution, a designated priority, a brief description of the potential construction implications, and an opinion of probable cost.

There are two opinion of probable cost appendices attached to this document. One cost opinion is sorted by project item number, and the other is sorted by priority. Considering the Community Center Renovation and Improvements project will potentially be bid in late 2016 or early 2017, all costs have been escalated with an estimated inflation percentage of 3.5%.

An estimated professional fee is included within the Opinions of Probable Costs for those projects that were not identified in the 2013 Building Investigation Report.

Due to the complexity of this construction project, Entech highly recommends that the Township contracts a Construction Manager to oversee the daily construction operations. An estimated fee for such a service is included within the Opinion of Probable Cost.

The intent of this report is to provide the Township with a comprehensive assessment of the current condition of the Community Center. With Entech's recommendations and opinions of probable costs, we intend to provide the Township with the information necessary to proceed into the construction document phase of this project.

2.0 ARCHITECTURAL PROJECTS

2.01 METAL ROOFING SYSTEM REPLACEMENT – NATATORIUM

The metal roof exhibits minor signs of finish failure on the surface, but overall does not appear to be in poor shape on its exposed side. However, the apparent absence or failure of the vapor barrier below the roof surface (evidenced by moisture exfiltration from under the roof and associated flashings) will necessitate replacement of the roofing system in order to adequately install a new vapor barrier and inspect substrates for moisture related damage. The gutters that transport the rainwater from the standing seam metal roofing system to the flat roof are not sloped properly, and have a substantial amount of standing water within them. Staining of ice and moisture seepage on the north and west façades of the Natatorium may be indicative of substrate corrosion. Steel deck and structure should be inspected prior to reinstallation of the roof.

Entech recommends replacing the existing standing seam metal roofing system over the Natatorium.

Recommended replacement includes the standing seam metal roofing panels, insulation, cover boards, acoustical metal deck, perimeter edge flashings, metal eaves and fascia, and gutters and downspouts.

Priority: High

Construction Implications: Construction would occur on the Natatorium roof. Due to the extensive nature of the roof replacement, the Natatorium would need to be closed during the duration of the roofing system replacement. If completed at the same time as the other Natatorium renovations and improvements, construction will be able to occur more quickly and will allow the contractors more favorable working conditions with an extended closure of the pool. Such a closure could be phased to occur over the summer when the outdoor pool is in operation.

Opinion of Probable Cost: $219,194

2.02 FLAT ROOF REPLACEMENT – NATATORIUM

The flat built-up bitumen roofing system is severely deteriorated due to an inadequate vapor barrier below and insufficient slope of the roof plane. There are numerous areas of the roof that have noticeable excessive saturation. Many of the roofing seams are failing. Due to the noticeable corrosion of the steel infrastructure within the Natatorium, the steel deck and metal roof deck should be inspected prior to reinstallation of the roof.

Entech recommends replacing the flat bitumen built-up roofing system over the Natatorium. Roof replacement would also include the flat roof over the group fitness room and the pool mechanical rooms.

The roofing system replacement should include the built-up roofing membrane, insulation, cover boards, perimeter flashings, parapet copings, and roof drains. It is suggested that several roofing systems (EPDM, bitumen, etc.) be investigated and considered for the replacement of the roofing system.

Priority: High

Construction Implications: Construction would occur on the Natatorium roof. Due to the extensive nature of the roof replacement, the Natatorium would need to be closed during the duration of the roofing system replacement. If completed at the same time as the other Natatorium renovations and improvements, construction will be able to occur more quickly and will allow the contractors more favorable working conditions with an extended closure of the pool. Such a closure could be phased to occur over the summer when the outdoor pool is in operation.

Opinion of Probable Cost: $120,556

2.03 FLAT ROOF REPLACEMENT – REMAINDER OF COMMUNITY CENTER

The flat bitumen built-up roofing system on the building (excluding the Natatorium) is in fair condition. Some bitumen base flashings on the east and central sections of roofing exhibited minor cracking. Considering the average life of this type of roofing system is approximately 15 years, replacement should be considered.

At a minimum, Entech suggests replacement of all reglet sealants at roof flashings for areas of roof which will not be replaced. The construction cost for this minimal scope of work is included within project 2.12 Sealant Replacement.

Priority: Low

Construction Implications: Construction would occur on the roof. The replacement of the roof for this project is not as extensive as the Natatorium roof; therefore, the building would be able to remain occupied during construction, minus possible minimal short duration shut-downs.

Opinion of Probable Cost (including estimated professional fee): $236,979

2.04 TRANSLUCENT WALL PANEL SYSTEM REPLACEMENT – NATATORIUM

Many of the translucent wall panels (Kalwall) have failed (internal moisture is visible) and there is evidence of improper installation (sealants installed over weep joints, failing and improper fasteners). As noted above for the roof replacement, underlying substrates, including structural components should be inspected for signs of corrosion or moisture related deterioration.

Entech recommends replacing the existing translucent wall panel (Kalwall) system at the clerestory of the Natatorium.

Kalwall is a reliable and reputable manufacturer of wall panel systems for natatorium installations. It is believed that Kalwall can be an appropriate system for the Natatorium if properly installed. Alternate manufacturers and glazing systems may also be considered for the glazing system based on design development of the repairs.

Priority: High

Construction Implications: Construction would occur on the Natatorium's exterior envelope, and would require a complete shut-down of the building area. If completed at the same time as the other Natatorium renovations and improvements, construction will be able to occur more quickly and will allow the contractors more favorable working conditions with an extended closure of the pool. Such a closure could be phased to occur over the summer when the outdoor pool is in operation.

Opinion of Probable Cost: $219,581

2.05 TRANSLUCENT WALL PANEL SYSTEM REPAIR – GYMNASIUM

Due to the continuous water leaks in the Gymnasium below the translucent wall panel (Kalwall) system, Entech recommends repairing the clerestory windows. Visible from the roof level, many of the sealant joints have failed and currently allow water to infiltrate the building. Entech recommends repairing the wall panel system located on the east, west, and south portions of the Gymnasium clerestory. The clerestory to the north of the Gymnasium is in good condition and does not require repair.

Entech recommends replacing all roof coping and flashing, as well as all sealant around the perimeter of the wall system.

Priority: Medium

Construction Implications: This work can be performed with minimal short duration shut-downs to the Gymnasium.

Opinion of Probable Cost (including estimated professional fee): $45,379

2.06 METAL WALL PANEL REPLACEMENT – NATATORIUM

Entech recommends the replacement of the Natatorium's metal wall panels (Centria). Due to the observed condensation on the panel joints, it is apparent that the gasketing has failed or is non-existent. Rust is beginning to form on the panels. Repair is not recommended due to the number of failed joints and the poor coordination and construction of adjacent materials.

Entech recommends replacing the Natatorium's metal wall panel system. Replacement offers the best probability of correcting the observed failures of the system.

The 2013 Building Investigation Report offered a solution to replace the metal wall panel with masonry. It is uncertain whether the existing foundation design of this portion of the building is adequate for carrying the additional load that would be imposed by installation of a masonry wall.

If replacement is with similar metal panels, consideration should be given to the detailing of panel to masonry and window to masonry joints with the intention of minimizing joint intersections and reducing potential points of envelope failure. The number and type of existing joints between various cladding materials makes maintaining a continuous vapor barrier a construction challenge. If existing

window openings are retained, consideration should be given to reinstalling sill flashings with proper jamb detailing (current flashings are not recessed into jamb masonry).

Priority: High

Construction Implications: Construction would occur on the Natatorium's exterior envelope, and would require a complete shut-down of the building area. If completed at the same time as the other Natatorium renovations and improvements, construction will be able to occur more quickly and will allow the contractors more favorable working conditions with an extended closure of the pool. Such a closure could be phased to occur over the summer when the outdoor pool is in operation.

Opinion of Probable Cost: $261,530

2.07 FOUNDATION DRAINAGE REPAIRS – NATATORIUM

Apparent from the interior wall damage on the south wall of the Natatorium and the west wall of the pool mechanical rooms, it is evident that the wall drainage system has failed or was never installed properly.

Entech recommends excavating and replacing the foundation drainage at the Natatorium, and to re-grade portions of the site in this vicinity.

Re-grading will need to take into consideration existing sidewalks, concrete pool terrace, and utilities located on the west and north elevations of the building.

Priority: High

Construction Implications: The scope of work will occur on the exterior side of the Natatorium wall. Due to potential shutdown of incoming utilities, this work should be completed at same time as other Natatorium work.

Opinion of Probable Cost: $106,038

2.08 FOUNDATION DRAINAGE REPAIRS – GYMNASIUM

Apparent from the interior wall damage on the lower level of the east side of the Gymnasium and storage rooms, it is evident that the wall drainage system has failed or was never installed properly.

In addition to the Natatorium foundation drainage repair, Entech recommends a similar scope of work at the east wall of the Gymnasium.

This scope of work would require removal of the concrete walkway at the southeast exterior door to the elevated running/walking track.

Priority: High

Construction Implications: Minimal, possible closure of running/walking track while work is being done at exterior door.

Opinion of Probable Cost (including estimated professional fee): $65,431

2.09 EXTERIOR MASONRY WALL AND SITE RESTORATION

Portions of the exterior enclosure are concrete masonry units. The condition of the masonry wall varies around the building. The walls around the Natatroium are in poor condition due to the excessive exfiltration of water vapor. The mortar joints are cracking in many locations, and the walls are stained. The remainder of the building's masonry walls are in fair condition, minus staining. This is typical due to the building's age.

Entech recommends masonry wall repairs and cleaning.

Repairs, cleaning, and sealing are required around the full perimeter of the building, but are primarily located at the Natatorium walls and the east façade of the gym. In addition to general cleaning, repointing, and sealing, Entech notes several specific areas of repair as follows:

- Leaks have been noted below parapet walls over the central portion of the building. Attempted flashing repairs have been unsuccessful to date.
- Consider replacement of recessed masonry panel perimeter mortar joints with sealant joints at east wall of gym.
- The sidewalks outside of the gymnasium exterior doors are cracking and do not allow the doors to close properly. The concrete sidewalks in these areas should be replaced.
- It is presumed that a few of the weep holes along the east gym wall are non-existent or are covered by bituminous pavement (likely). This could be contributing to build up of water in the wall cavity.

Priority: High

Construction Implications: The majority of this work can be performed while the building is occupied. Any work at or in the vicinity of an exterior emergency egress door would require a temporary shut-down of that area of the building.

Opinion of Probable Cost: $68,517

2.10 GENERAL INTERIOR RENOVATIONS

Entech recommends select renovations to the Community Center's interior finishes. Areas identified by Entech are primarily located in the Natatorium wing of the building. Some locations are recommended in the Gymnasium wing of the building. The following is a list of observed repairs that will be required. Some additional repairs may become apparent as the project proceeds.

- Repaint / repoint interior surfaces of masonry walls at Natatorium. Typical of the south wall of the Natatorium and the south and west walls of the equipment and mechanical rooms.
- Repaint / repoint interior surfaces of masonry walls at the Gymnasium along the east wall.

- Repair and repaint gypsum wall surfaces at the south wall of the suspended track in the Gymnasium.
- Repaint interior surfaces of structural steel at the Natatorium. Inspect substrates prior to repainting for moisture related damage or corrosion.
- Replace door hardware at the Natatorium doors – typical throughout.
- Repaint steel door frames in the Natatorium.
- Repair / repaint portion of gypsum at upper east wall of the Natatorium where wall has cracked.
- Repaint steel components of bleachers in the Natatorium.

Priority: High

Construction Implications: The majority of this work can be performed while the building is occupied. Any work at or in the vicinity of an exterior emergency egress door would require a temporary shut-down of that area of the building. Regarding work that would occur within the Natatorium, it is recommended to perform the work at the same time as the other Natatorium renovations and improvements. Construction will be able to occur more quickly and will allow the contractors more favorable working conditions with an extended closure of the pool. Such a closure could be phased to occur over the summer when the outdoor pool is in operation.

Opinion of Probable Cost: $55,751

2.11 REPLACE EXTERIOR STAIRS AT EAST SIDE OF GYMNASIUM

The exterior stair at the east side of the Gymnasium is in poor condition. The most prominent deficiencies include masonry cracking. There is evidence of settlement and movement of the stair away from the building wall. Due to the lack of any detail within the original construction documents, the cause of the deficiencies cannot be determined without destructive testing.

Considering the amount of necessary repairs and its age, Entech recommends replacing the stairs.

Priority: Medium

Construction Implications: This work would require the temporary closure of the adjacent Fitness Room.

Opinion of Probable Cost (including estimated professional fee): $18,353

2.12 SEALANT REPLACEMENT

The elastomeric sealant joints around the building are in poor condition due to poor installation and age. The locations of these sealant joints include the window and door, the horizontal perimeter sealant at the concrete sidewalks, and the roofing system's flashing reglets. The majority of the window sealant is cracking and brittle. The horizontal perimeter sealant between the concrete walkways and building is missing in many locations, which allows water to infiltrate below the concrete walk and potentially

cause damage. The roofing flashing reglet sealant is beginning to become brittle and is missing in a few locations.

Priority: High

Construction Implications: The majority of this work can be performed while the building is occupied. Any work at or in the vicinity of an exterior emergency egress door would require a temporary shut-down of that area of the building.

Opinion of Probable Cost (including estimated professional fee): $19,296

3.0 MECHANICAL (HVAC) PROJECTS

3.01 BOILER REPLACEMENT – NATATORIUM

The existing Natatorium design utilizes two sources (gas-fired boiler and Pool Dehumidification Unit heat rejection) for indoor pool water heating. When the Pool Dehumidification Unit (PDU) is in operation, the heat of rejection of the refrigerant cycle provides most of the heat required to maintain the indoor pool temperature. However, there are times of the year when the PDU heat is not adequate and the boiler energizes to provide the additional heating for the pool water. The boiler for the indoor pool is in poor condition and requires replacement. Part of the reason for the poor condition of the boiler is the result of drawing combustion air laden with chlorine through its atmospheric type burner. Entech's recommended boiler replacement will eliminate this issue (see below).

In addition, there is a boiler dedicated to heating the outdoor pool. The intent of the boiler was to lengthen the seasonal operation of the outdoor pool beyond the traditional Memorial Day to Labor Day timeframe, but usage of the pool during these shoulder months is virtually non-existent and after a few seasons, the boiler was shut off. The boiler for the outdoor pool is not currently functional and has not been needed for the operation of the outdoor pool.

Entech recommends the following scope of work: Remove both the indoor and outdoor pool water heating boilers. The outdoor boiler will not be replaced. Install one new boiler, in its place, to heat the indoor pool. Provide a boiler with sealed combustion which draws its air directly from the outdoors, in lieu of through the pool filter room. The capacity of the boiler would depend on and be coordinated with the PDU replacement technology described in 3.02. Alternatively, two boilers sized at 50% of the total required capacity could be installed to provide soft redundancy in the event of a boiler failure in the future. At minimal additional cost, piping and valves could also be added to enable the new boiler(s) to serve the outdoor pool for additional flexibility and to maintain the original design intent.

Priority: High

Construction Implications: Construction would occur within the pool mechanical room and would require, at minimum, some periodic shutdowns of the Natatorium. If completed at the same time as the other Natatorium upgrades, construction will be able to occur more quickly and will allow the contractors more favorable working conditions with an extended closure of the pool. Such a closure could be phased to occur over the summer when the outdoor pool is in operation.

Opinion of Probable Cost: $147,798

3.02 POOL DEHUMIDIFICATION UNIT REPLACEMENT – NATATORIUM

The existing Dectron pool dehumidification unit (PDU) provides space heating, cooling, and dehumidification and pool water heating for the Natatorium; it has been in service for approximately 11 years. PDUs have a shorter life expectancy than other HVAC systems due to the harsh chemical environment the equipment functions within. Most PDUs are replaced around 15 years of age, if not before, due to escalating maintenance/repair costs. Staff have reported a steady increase in the amount of maintenance and service efforts for the existing Dectron PDU.

Entech recommends the replacement of the unit in the next few years. If implemented with this project scope, the PDU would be replaced in year 12 or 13 of its service life and its replacement would be coordinated with the other Natatorium upgrades (such as boiler capacity, reduced lighting loads, UV water treatment, and airflow/ventilation improvements.) Therefore, Entech is recommending replacement of the unit concurrent with the other work in the natatorium space.

There are two basic types of PDUs which represent the majority of the market-share for natatorium HVAC: Low Outside Air with pool heat rejection and DX Cooling (represented in this report by a Seresco unit which is similar to the existing Dectron Unit) and High Outside Air Energy Recovery without pool heat rejection (represented in this report by an Innovent unit).

In this climate region, the Seresco style unit has dominated the market since its development in the late 80s due to its significant increase in efficiency over the previous style of pool heating and ventilating. It utilizes the refrigeration cycle to transfer heat from the warm humid pool air to the pool water and outside air, reducing the need for another source of heat input for the pool water heating. This technology remains a solid performer and a standard bearer for well-designed natatorium heating and cooling needs.

The Innovent unit represents a more recent (but still decades old) paradigm shift in the market and has been increasing market share as its benefits and successes are becoming more well known. The Innovent unit utilizes outside air to provide the bulk of the dehumidification needs of the pool for most of the year, only requiring mechanical dehumidification for a fraction of the annual operating hours. Energy recovery provides the heating (reheat) needed to maintain comfortable conditions in the pool with minimal additional heating energy. Due to the reduced mechanical cooling, there is little heat rejection and a larger boiler is required to provide heat for the pool water. However, the cost of providing heat for the pool water is typically less than the cost of mechanical cooling, resulting in overall annual energy and cost savings. In addition, Innovent units generally cost less than the Seresco Style units for a lower total life-cycle cost of the system.

Entech is recommending the Innovent unit as the preferred replacement option for the existing PDU.

Priority: High

Construction Implications: The Natatorium will need to be closed for the duration of the PDU replacement work, which should be completed over the summer when the indoor pool can be closed and the outdoor pool can be utilized.

Opinion of Probable Cost (including estimated professional fee): $423,151

3.03 AIR DISTRIBUTION IMPROVEMENTS – NATATORIUM

One of the issues to be mitigated involves the aluminum window wall assemblies along the east wall of the Natatorium. Aluminum window wall assemblies are not often utilized in natatoriums due to the difficulty of keeping the glazing free from condensation. The Natatorium experiences condensation on glass and metal surfaces in the winter. One of the methods for reducing the amount and frequency of condensation involves blowing air across the surfaces that accumulate condensation, much the same way defrost works on an automobile windshield. This method is further aided by the use of the Innovent Unit method of introducing greater quantities of outdoor air at lower overall humidity. The existing fabric air duct does not direct the air toward these surfaces with enough velocity or volume.

Entech recommends reconfiguring the ductwork to provide new rigid round aluminum ductwork with registers directed at each span of the glazing. The duct will be located so it does not block the light coming from the newly replaced lighting fixtures and will provide an air wash of the window wall assembly from a perimeter duct located at an elevation of about 11 feet high.

Priority: High

Construction Implications: Similar to the PDU replacement, the Natatorium will need to be closed for the duration of the duct replacement work which should be completed over the summer when the indoor pool can be closed and the outdoor pool can be utilized.

Opinion of Probable Cost: $63,553

3.04 AIR RETURN IMPROVEMENTS – NATATORIUM

The Natatorium has a chlorine odor from chloramines, which accumulate just above the pool surface. Chloramines are caused by chlorine reacting with sweat and urine. The return air connection to the Dectron dehumidification unit is 48-inches above the pool deck and this elevation is not ideal for removing the chloramine layer.

It is best to have a low exhaust duct extended the length of the pool, just above the pool deck; however, the existing physical constraints do not permit this unless a duct can be installed within the collapsible bleachers. This low exhaust duct would not allow the bleachers to collapse along the wall.

Entech recommends a single exhaust grille, 8" above the pool deck, located near the door to Equipment Storage. This air quantity will be exhausted versus returned to the new Natatorium HVAC unit. The exhaust volume will be made-up by outdoor ventilation air introduced through the new Natatorium HVAC unit.

Priority: High

Construction Implications: Similar to the PDU replacement, the Natatorium will need to be closed for the duration of the duct replacement work, which should be completed over the summer when the indoor pool can be closed and the outdoor pool can be utilized.

Opinion of Probable Cost: $49,266

3.05 UV WATER TREATMENT – NATATORIUM

The Natatorium has a chlorine odor from chloramines, which accumulate just above the pool surface. Chloramines are caused by chlorine reacting with sweat and urine. Entech recommends utilizing ultra-violet water treatment on the large indoor pool, which will kill germs and reduce the quantity of chlorine required. This will aid in the reduction of chloramines (odor) while maintaining a safe water chemistry.

Ultra-violet water treatment is also advertised for outdoor pools and spas, but these units will have less of an impact on the pool environment. The staff can add UV water treatment to the other pools in the future, if desired.

Priority: High

Construction Implications: Construction would occur within the pool mechanical room and would require, at minimum, some periodic shutdowns of the Natatorium. If completed at the same time as the other Natatorium upgrades, construction will be able to occur more quickly and will allow the contractors more favorable working conditions with an extended closure of the pool. Such a closure could be phased to occur over the summer when the outdoor pool is in operation.

Opinion of Probable Cost (including estimated professional fee): $58,366

3.06 ROOFTOP UNIT IMPROVEMENTS – GYMNASIUM

The Gymnasium has experienced a number of problems with moisture and humidity over the past decade. While some of the issues have been unrelated to the HVAC system, the HVAC system has been unable to adequately control the humidity in the space. The two large 50 ton 10,000 CFM roof-top HVAC units are sized for an absolute peak occupant load, which the Gymnasium seldom, if ever, experiences. Oversized cooling equipment runs intermittently and does a poor job of reducing and controlling humidity levels, particularly humidity introduced from the outside air requirements.

Entech recommends installing variable frequency drives (VFDs) on the blowers and replacing selected compressors with those that have unloading capabilities. This control will allow the units to operate at a reduced capacity when needed, run longer, and cycle on and off less frequently. Longer run times and less cycling will remove humidity better at the cooling coil. Lower fan speeds will decrease the volume of high humidity outdoor air added on a proportional basis.

Priority: High

Construction Implications: This work can be performed with minimal short duration shut-downs to the Gymnasium.

Opinion of Probable Cost: $133,308

3.07 AIR RETURN IMPROVEMENTS – GYMNASIUM

The return air grilles that serve the two large 50 ton 10,000 CFM HVAC units serving the Gymnasium are located approximately 24 feet above the Gymnasium floor. These returns work well in the cooling season as heat rises, but do not effectively return the colder air that resides near the floor during the heating season.

Entech recommends extending air return ducts down to floor level and installing return air grilles. The new return ducts and grilles will need to be strategically located for both appearance and protection from damage. Size the new returns for only a portion of the total 10,000 CFM air flow from each unit and balance back return air from the existing returns. Dampers could also be added to close these low returns in the summer.

Priority: Low

Construction Implications: This work can be performed with minimal short duration shut-downs to the Gymnasium.

Opinion of Probable Cost (including estimated professional fee): $39,117

3.08 SUPPLEMENTAL AIR-CONDITIONING – SPIN ROOM

A large portion of the open office area has been converted to a spin room. This space contains 17 stationary bicycles, which are used for group exercise classes. Individuals involved in physical activity generate significantly more heat and humidity than those involved in office work. When all 17 bikes are utilized, this activity adds an internal load of 4-tons of air conditioning.

Entech recommends adding additional air conditioning.

Two options for additional air-conditioning include a package roof-top air conditioner or a split system unit with a ceiling mounted fan coil. The walls do not allow space for wall mounted fan coils. There is also concern that a ceiling mounted fan coil might produce concentrated breezes which could create a draft for those individuals close to the discharge. One additional small roof-top with supplemental ceiling diffusers is proposed.

Priority: Medium

Construction Implications: Closure of Spin Room will be required for the installation of the additional ductwork, diffusers, and electrical conduit. Duration should be relatively short (1 - 2 weeks).

Opinion of Probable Cost: $46,672

4.0 LIGHTING PROJECTS

4.01 REPLACE LIGHTING - NATATORIUM

Entech recommends replacing the Natatorium luminaires. The existing luminaires are deteriorating. Luminaire and duct locations will need to be coordinated, which will provide a more efficient lighting layout for the pool and deck surfaces. Currently, the fabric duct blocks a majority of the lumen output from the existing luminaires. Daytime measurements on a bright sunny day in the Natatorium averaged 40 footcandles around the deck perimeter. Nighttime measurements were below 10 footcandles average, with lows in the 4 footcandle range and highs only reaching 9 footcandles. These values do not meet the recommended levels from Illuminating Engineering Society (IES). IES recommends 10 footcandles average on the water surface and deck surface for recreational use. Measurements were not taken in the water area itself, although visually it appeared to be equal to or less than the deck measurements. In the last few years, LED sourced luminaires have become more popular than HID (metal halide) sourced luminaires. Several benefits are gained from the use of LED fixtures, including greater optical efficiency, instant on/off, high lumen maintenance factors, longer lamp life, and better color rendering. The current 250 watt (input wattage of 295) metal halide lamps have an average life of 12,000 hours (50% failure), with a reduction in lumen output to 75% of rated lumens in 8,000 hours, and 63 lumens per watt. Current LED fixtures have average lifespans over 100,000 hours, with a reduction in lumen output of only 88% of rated lumens in 60,000 hours and 90+ lumens per watt, which greatly reduces maintenance costs and increases energy savings. A new, well-coordinated lighting layout utilizing LED fixtures will provide higher footcandle averages, while lowering energy consumption and future maintenance costs for the Township.

It is understood that the Township has purchased LED fixtures for the Natatorium. Entech will include the installation of these fixtures in the construction project.

Priority: High

Construction Implications: This scope of work would require a shut-down of the Natatorium. If completed at the same time as the other Natatorium upgrades, construction will be able to occur more quickly and will allow the contractors more favorable working conditions with an extended closure of the pool. Such a closure could be phased to occur over the summer when the outdoor pool is in operation.

Opinion of Probable Cost (excluding luminaire material cost): $36,948

4.02 REPLACE LIGHTING – GYMNASIUM

The existing luminaires utilize 8 compact fluorescent lamps (CFL) at 42 watts each, with bi-level switching (4 lamps or 8 lamps energized). The CFL's average life is 12,000 hours. Within that time, it is estimated that 50 percent of the lamps will fail. Assuming an average usage of 15 hour days, 7 days a week, approximately half the lamps will fail in two years. Daytime measurements during a sunny day averaged 16 footcandles with half the lamps on. IES recommends 30 footcandles for recreational play. It is assumed that all lamps energized, 30 footcandles would not be achieved since sunlight added to the measured 16 footcandles. When all lamps are energized in the Gymnasium, the luminaire's input

wattage is 372 watts with estimated light levels less than 30 footcandles. A preliminary layout utilizing LED luminaires at 160 watts each would produce an average of over 40 footcandles for the courts. The life of an LED luminaire exceeds 100,000 hours, consumes 57 percent less energy, and would provide the 30 footcandles average recommended by IES.

Utility rebates may be available at the time of construction from the utility company for this lighting upgrade.

Priority: Low

Construction Implications: This scope of work would require a shut-down of the Gymnasium of approximately 1-2 weeks.

Opinion of Probable Cost (including estimated professional fee): $44,542

Opinion of Probable Energy Savings: Compared to the existing light fixtures, the cost savings would be negligible.

4.03 REPLACE LIGHTING – MISCELLANEOUS

During the site survey, interest was expressed in upgrading the existing T8 fluorescent luminaires to LED for energy and maintenance savings. The majority of the building's 2x4 luminaires contain a parabolic lens. By design, a parabolic lens directs light on the floor/desk top, while often creating dark walls and ceilings (cave effect). In addition, there is no lamp shielding for activities in the face-up positions. New volumetric-type LED luminaires would reduce energy consumption by 66% and 75% for existing three and four lamped 2x4 luminaires, respectively, while also providing a soft glow for direct viewing. The volumetric type luminaires will provide more desirable uniform and diffuse illumination. LED luminaires typically feature dimming capabilities as a standard option. Dimming certain areas may add to the overall occupant satisfaction while further reducing energy consumption in areas utilized for yoga or similar low energy/movement activities. In addition, luminaire quantities may be reduced in the spinning and vending areas. Lastly, utility rebates may be available at the time of construction from the utility company.

Although the whole building could benefit from an LED upgrade for further maintenance and energy savings, faster paybacks are achieved with 3 and 4 lamp, parabolic, 2x4, luminaires due to their poor light distribution and higher energy consumption. Other areas can be investigated upon request, however; due to higher luminaire costs of linear LED luminaires (lobby lighting), lower wattage of two-lamp luminaires, or lower utilized luminaires (under track deck, storage/utility rooms, multi-room near kitchen), paybacks would be longer.

Please refer to the following page for areas currently recommended for LED upgrade.

Priority: Low

Construction Implications: This scope of work would require temporary closures of interior spaces.

Opinion of Probable Cost (including estimated professional fee): $45,157

Opinion of Probable Energy Savings: $2,700 / year ($6,000 for first year pending possible PPL rebate)

Bethlehem Township - Community Center - Fluorescent T8 to LED Upgrade

	Existing								Proposed					
Location	Description	Qty	Lamp Wattage	Input Wattage	Total Wattage	Source	Voltage		Description	Qty	Input Wattage	Total Wattage	Source	Voltage
Pool Office	2x4, 4L, Para	4	32	116	464	T8	277		2x4	4	30	120	LED	277
Spinning	2x4, 4L, Para	14	32	116	1,624	T8	277		2x4	9	30	270	LED	277
Offices (near spinning)	2x4, 4L, Para	8	32	116	928	T8	277		2x4	8	30	240	LED	277
Multi-pur (pool over)	2x4, 3L, Para	23	32	86	1,978	T8	277		2x4	23	30	690	LED	277
Weight Rm	2x4, 3L, Para	11	32	86	946	T8	277		2x4	11	30	330	LED	277
Treadmill Rm	2x4, 3L, Para	14	32	86	1,204	T8	277		2x4	14	30	420	LED	277
Daycare	2x4, 3L, Para	9	32	86	774	T8	277		2x4	9	30	270	LED	277
Lobby to Gym	2x4, 2L, Para	9	32	56	504	T8	277		2x4	6	30	180	LED	277
	Totals	92			**8,422**					84		**2,520**		

	Days	Hours	Weeks	Operating Hours
Annual Hours of Operation	7	15	52	**5,460**
Price per kWh				**$0.077**
Demand Charge per kW				**$4.161**

Notes:

Maintenance cost will be reduced

Overall quality and aesthetics of lighting increased

Total Wattage Reduction		**5,902**
Annual Savings	**kWh**	**32,225**
	Dollars kWh	**$2,491**
	Demand Charge Savings	**$295**
Possible PPL Rebate, First year only 0.10 per kWh saved	0.1	**$3,222**
FIRST YEAR SAVINGS		**$6,008**

4.04 LIGHTING IMPROVEMENTS – STAIR AT NORTH GYMNASIUM / TRACK

NFPA 101 requires 10 footcandles on the stair walking surface during time of use. The north stair from the Gymnasium floor to the upper walking track did not meet the 10 footcandles. The landing measured 3.3 footcandles and halfway up the second set of stairs measure 1.9 footcandles during a sunny the day.

Entech recommends adding two luminaires, one on the track's deck for the stair landing and one on the upper deck above the stair opening. Emergency lighting was not measured. A 1.0 footcandle average is required for emergency lighting. There are battery packs in the area. A battery back-up could be added to the new luminaires if required to achieve the 1.0 average for emergency.

Priority: High

Construction Implications: Minimal

Opinion of Probable Cost (including estimated professional fee): $2,628

Item No.	Description	Priority	Material [4]	Labor [3]	Equip	Subtotal	Mark-Up		Subtotal	2017 Escalation	Subtotal	Estimated Professional Fee [5]	Total
							Contractor's Fees 25%	Contingency 15%		3.5%			
2.01	Metal Roofing System Replacement - Natatorium	1-High	$ 71,550	$ 73,223	$ 6,500	$ 151,273	$ 37,818	$22,691	$211,782	$7,412	$ 219,194	$ -	$ 219,194
2.02	Flat Roof Replacement - Natatorium	1-High	$ 17,750	$ 59,950	$ 5,500	$ 83,200	$ 20,800	$12,480	$116,479	$4,077	$ 120,556	$ -	$ 120,556
2.03	Flat Roof Replacement - Remainder of Comm. Center	3-Low	$ 35,425	$ 113,364	$ 5,500	$ 154,289	$ 38,572	$23,143	$216,005	$7,560	$ 223,565	$ 13,414	$ 236,979
2.04	Translucent Wall Panel System Replacement - Natatorium	1-High	$ 88,650	$ 58,890	$ 4,000	$ 151,540	$ 37,885	$22,731	$212,156	$7,425	$ 219,581	$ -	$ 219,581
2.05	Translucent Wall Panel System Repair - Gymnasium	2-Medium	$ 6,725	$ 21,320	$ 1,500	$ 29,545	$ 7,386	$4,432	$41,363	$1,448	$ 42,811	$ 2,569	$ 45,379
2.06	Metal Wall Panel Replacement - Natatorium	1-High	$ 137,500	$ 35,490	$ 7,500	$ 180,490	$ 45,123	$27,074	$252,686	$8,844	$ 261,530	$ -	$ 261,530
2.07	Foundation Drainage Repairs - Natatorium	1-High	$ 32,300	$ 35,880	$ 5,000	$ 73,180	$ 18,295	$10,977	$102,452	$3,586	$ 106,038	$ -	$ 106,038
2.08	Foundation Drainage Repairs - Gymnasium	1-High	$ 17,300	$ 21,800	$ 3,500	$ 42,600	$ 10,650	$6,390	$59,640	$2,087	$ 61,727	$ 3,704	$ 65,431
2.09	Exterior Masonry Wall and Site Restoration	1-High	$ 8,746	$ 36,040	$ 2,500	$ 47,286	$ 11,821	$7,093	$66,200	$2,317	$ 68,517	$ -	$ 68,517
2.10	General Interior Renovations	1-High	$ 10,166	$ 25,060	$ 3,250	$ 38,476	$ 9,619	$5,771	$53,866	$1,885	$ 55,751	$ -	$ 55,751
2.11	Replace Exterior Stairs at East Side of Gymnasium	2-Medium	$ 3,848	$ 6,601	$ 1,500	$ 11,949	$ 2,987	$1,792	$16,729	$586	$ 17,314	$ 1,039	$ 18,353
2.12	Sealant Replacement	1-High	$ 1,813	$ 9,500	$ 1,250	$ 12,563	$ 3,141	$1,884	$17,588	$616	$ 18,204	$ 1,092	$ 19,296
								Architectural Projects Subtotal			***$ 1,414,789***	***$ 21,817***	***$ 1,436,606***
3.01	Boiler Replacement - Natatorium	1-High	$ 60,000	$ 41,000	$ 1,000	$ 102,000	$ 25,500	$15,300	$142,800	$4,998	$ 147,798	$ -	$ 147,798
3.02	Pool Dehumidification Unit Replacement - Natatorium	1-High	$ 220,000	$ 45,500	$ 10,000	$ 275,500	$ 68,875	$41,325	$385,700	$13,500	$ 399,200	$ 23,952	$ 423,151
3.03	Air Distribution Improvements - Natatorium	1-High	$ 10,320	$ 31,540	$ 2,000	$ 43,860	$ 10,965	$6,579	$61,404	$2,149	$ 63,553	$ -	$ 63,553
3.04	Air Return Improvements - Natatorium	1-High	$ 12,000	$ 20,000	$ 2,000	$ 34,000	$ 8,500	$5,100	$47,600	$1,666	$ 49,266	$ -	$ 49,266
3.05	UV Water Treatment - Natatorium	1-High	$ 21,000	$ 17,000	$ -	$ 38,000	$ 9,500	$5,700	$53,200	$1,862	$ 55,062	$ 3,304	$ 58,366
3.06	Rooftop Unit Improvements - Gymnasium	1-High	$ 58,000	$ 34,000	$ -	$ 92,000	$ 23,000	$13,800	$128,800	$4,508	$ 133,308	$ -	$ 133,308
3.07	Air Return Improvements - Gymnasium	3-Low	$ 5,158	$ 20,310	$ -	$ 25,468	$ 6,367	$3,820	$35,655	$1,248	$ 36,903	$ 2,214	$ 39,117
3.08	Supplemental Air-Conditioning - Spin Room	2-Medium	$ 13,045	$ 18,165	$ 1,000	$ 32,210	$ 8,053	$4,832	$45,094	$1,578	$ 46,672	$ -	$ 46,672
								Mechanical Projects Subtotal			***$ 931,762***	***$ 29,470***	***$ 961,232***
4.01	Replace Lighting - Natatorium	1-High	$ 1,038	$ 21,461	$ 3,000	$ 25,499	$ 6,375	$3,825	$35,698	$1,249	$ 36,948	$ -	$ 36,948
4.02	Replace Lighting - Gymnasium	3-Low	$ 19,250	$ 8,750	$ 1,000	$ 29,000	$ 7,250	$4,350	$40,600	$1,421	$ 42,021	$ 2,521	$ 44,542
4.03	Replace Lighting - Miscellaneous	3-Low	$ 25,200	$ 4,200	$ -	$ 29,400	$ 7,350	$4,410	$41,160	$1,441	$ 42,601	$ 2,556	$ 45,157
4.04	Lighting Improvements - North Stair at Gymnasium/Track	1-High	$ 758	$ 953	$ -	$ 1,711	$ 428	$257	$2,395	$84	$ 2,479	$ 149	$ 2,628
								Lighting Projects Subtotal			***$124,049***	***$5,226***	***$129,275***

Conditional Comments:

1. This Opinion of Probable Cost is generated through the use of Means, Information from Select Vendors, Contractors, and past project experience.
2. Cost represented herein are subjec to change based upon Market Value of Materials and Availablility and Inflation.
3. Labor rates include prevailing wage rates.
4. Material costs assume tax exempt status.
5. Estimated professional fees are included for all projects that are outside Entech's professional service scope of work.

Total Construction Cost Estimate	***$ 2,470,599***	***$ 56,513***	***$ 2,527,112***
10% of Total Cost Estimated for Construction Manager Fees	*$ 247,060*	→	*$ 247,060*

Estimated Project Cost for Renovations & Improvements	***$ 2,774,172***

Item No.	Description	Priority	Material [4]	Labor [3]	Equip	Subtotal	Mark-Up		Subtotal	2017 Escalation	Subtotal	Estimated Professional Fee [5]	Total
							Contractor's Fees 25%	Contingency 15%		3.5%			
2.01	Metal Roofing System Replacement - Natatorium	**1-High**	$ 71,550	$ 73,223	$ 6,500	$ 151,273	$ 37,818	$22,691	$211,782	$ 7,412	$ 219,194	$ -	$ 219,194
2.02	Flat Roof Replacement - Natatorium	**1-High**	$ 17,750	$ 59,950	$ 5,500	$ 83,200	$ 20,800	$12,480	$116,479	$ 4,077	$ 120,556	$ -	$ 120,556
2.04	Translucent Wall Panel System Replacement - Natatorium	**1-High**	$ 88,650	$ 58,890	$ 4,000	$ 151,540	$ 37,885	$22,731	$212,156	$ 7,425	$ 219,581	$ -	$ 219,581
2.06	Metal Wall Panel Replacement - Natatorium	**1-High**	$ 137,500	$ 35,490	$ 7,500	$ 180,490	$ 45,123	$27,074	$252,686	$ 8,844	$ 261,530	$ -	$ 261,530
2.07	Foundation Drainage Repairs - Natatorium	**1-High**	$ 32,300	$ 35,880	$ 5,000	$ 73,180	$ 18,295	$10,977	$102,452	$ 3,586	$ 106,038	$ -	$ 106,038
2.08	Foundation Drainage Repairs - Gymnasium	**1-High**	$ 17,300	$ 21,800	$ 3,500	$ 42,600	$ 10,650	$6,390	$59,640	$ 2,087	$ 61,727	$ 3,704	$ 65,431
2.09	Exterior Masonry Wall and Site Restoration	**1-High**	$ 8,746	$ 36,040	$ 2,500	$ 47,286	$ 11,821	$7,093	$66,200	$ 2,317	$ 68,517	$ -	$ 68,517
2.10	General Interior Renovations	**1-High**	$ 10,166	$ 25,060	$ 3,250	$ 38,476	$ 9,619	$5,771	$53,866	$ 1,885	$ 55,751	$ -	$ 55,751
2.12	Sealant Replacement	**1-High**	$ 1,813	$ 9,500	$ 1,250	$ 12,563	$ 3,141	$1,884	$17,588	$ 616	$ 18,204	$ 1,092	$ 19,296
3.01	Boiler Replacement - Natatorium	**1-High**	$ 60,000	$ 41,000	$ 1,000	$ 102,000	$ 25,500	$15,300	$142,800	$ 4,998	$ 147,798	$ -	$ 147,798
3.02	Pool Dehumidification Unit Replacement - Natatorium	**1-High**	$ 220,000	$ 45,500	$ 10,000	$ 275,500	$ 68,875	$41,325	$385,700	$ 13,500	$ 399,200	$ 23,952	$ 423,151
3.03	Air Distribution Improvements - Natatorium	**1-High**	$ 10,320	$ 31,540	$ 2,000	$ 43,860	$ 10,965	$6,579	$61,404	$ 2,149	$ 63,553	$ -	$ 63,553
3.04	Air Return Improvements - Natatorium	**1-High**	$ 12,000	$ 20,000	$ 2,000	$ 34,000	$ 8,500	$5,100	$47,600	$ 1,666	$ 49,266	$ -	$ 49,266
3.05	UV Water Treatment - Natatorium	**1-High**	$ 21,000	$ 17,000	$ -	$ 38,000	$ 9,500	$5,700	$53,200	$ 1,862	$ 55,062	$ 3,304	$ 58,366
3.06	Rooftop Unit Improvements - Gymnasium	**1-High**	$ 58,000	$ 34,000	$ -	$ 92,000	$ 23,000	$13,800	$128,800	$ 4,508	$ 133,308	$ -	$ 133,308
4.01	Replace Lighting - Natatorium	**1-High**	$ 1,038	$ 21,461	$ 3,000	$ 25,499	$ 6,375	$3,825	$35,698	$ 1,249	$ 36,948	$ -	$ 36,948
4.04	Lighting Improvements - North Stair at Gymnasium/Track	**1-High**	$ 758	$ 953	$ -	$ 1,711	$ 428	$257	$2,395	$ 84	$ 2,479	$ 149	$ 2,628
								High Priority Subtotal			***$ 2,018,712***	***$ 32,200***	***$ 2,050,913***
2.05	Translucent Wall Panel System Repair - Gymnasium	**2-Medium**	$ 6,725	$ 21,320	$ 1,500	$ 29,545	$ 7,386	$4,432	$41,363	$ 1,448	$ 42,811	$ 2,569	$ 45,379
2.11	Replace Exterior Stairs at East Side of Gymnasium	**2-Medium**	$ 3,848	$ 6,601	$ 1,500	$ 11,949	$ 2,987	$1,792	$16,729	$ 586	$ 17,314	$ 1,039	$ 18,353
3.08	Supplemental Air-Conditioning - Spin Room	**2-Medium**	$ 13,045	$ 18,165	$ 1,000	$ 32,210	$ 8,053	$4,832	$45,094	$ 1,578	$ 46,672	$ -	$ 46,672
								Medium Priority Subtotal			***$ 106,797***	***$ 3,607***	***$ 110,405***
2.03	Flat Roof Replacement - Remainder of Comm. Center	**3-Low**	$ 35,425	$ 113,364	$ 5,500	$ 154,289	$ 38,572	$23,143	$216,005	$ 7,560	$ 223,565	$ 13,414	$ 236,979
3.07	Air Return Improvements - Gymnasium	**3-Low**	$ 5,158	$ 20,310	$ -	$ 25,468	$ 6,367	$3,820	$35,655	$ 1,248	$ 36,903	$ 2,214	$ 39,117
4.02	Replace Lighting - Gymnasium	**3-Low**	$ 19,250	$ 8,750	$ 1,000	$ 29,000	$ 7,250	$4,350	$40,600	$ 1,421	$ 42,021	$ 2,521	$ 44,542
4.03	Replace Lighting - Miscellaneous	**3-Low**	$ 25,200	$ 4,200	$ -	$ 29,400	$ 7,350	$4,410	$41,160	$ 1,441	$ 42,601	$ 2,556	$ 45,157
								Low Priority Subtotal			***$345,090***	***$20,705***	***$365,795***

Total Construction Cost Estimate	***$ 2,470,599***	***$ 56,513***	***$ 2,527,112***
10% of Total Construction Cost Estimated for Construction Manager Fees	*$ 247,060*	→	*$ 247,060*

Estimated Project Cost for Renovations & Improvements	***$ 2,774,172***

Conditional Comments:

1. This Opinion of Probable Cost is generated through the use of Means, Information from Select Vendors, Contractors, and past project experience.
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