



Valley Engineer Newsletter

September, 2019

UPCOMING PROGRAMS

PSPE State Conference
 September 18 - 21, 2019
 Wind Creek Casino, Bethlehem, PA



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 OF
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**LEHIGH VALLEY CHAPTER
 (ORGANIZED 1935)**

CARBON, LEHIGH, MONROE, & NORTHAMPTON COUNTIES

President's Message

Alex Dezubay, PE

I would like to introduce myself to those members who do not know me well. For 12 years I have been a consulting engineer in my own business. My degree (BSME Penn State) and practice are mechanical engineering doing design, field measurements, and troubleshooting for educational and industrial clients. My career before consulting was in manufacturing plants; steel, aluminum, building products, fasteners, chemicals, and roofing. My PE license is essential to my continuing business. Offices held in LVPSPE have been Secretary, Treasurer, Director, Chairman of Scholarship Committee, Vice President, and now President.

September 2019 brings us into a new Lehigh Valley PSPE season. This month we can enjoy the PSPE state conference locally at Wind Creek (formerly Sands Casino) 77 Wind Creek Boulevard, Bethlehem, PA 18015. In addition to having the conference close to home, our own Michael Basta is PSPE president for the upcoming 2019-2020 year. A number of LVPSPE members will be giving PDH presentations, so please register and attend.

As in the past we will have monthly events. MATHCOUNTS®, awards for Engineer of the year, and young engineer of the year, and award scholarships to high school seniors starting their engineering education in colleges. We thank all those who contributed their time and resources to make these events a success.

Scholarship Awards and Installation of Officers Banquet

In May of this year the Lehigh Valley Chapter, Pennsylvania Society of Professional Engineers held its annual scholarship awards and installation of officers for banquet at DeSales University, Center Valley, PA.



2019-2020 slate of officers: Alt. State Director-Angelica Fordran, PE; Chapter Directors Mary Rooney, PE, Frank Walsh, PE, Alexa Rooney, EIT; Secretary-Chris Williams, PE, LEED AP; Treasurer-Ray Szczucki, PE, Vice President-Jeff Kutz, PE; President-Alex Dezubay, PE; and PSPE President Mike Basta, PE.

The Chapter presented \$2,000.00 scholarships to five area high school students enrolled in an engineering curriculum at a college or university. These winners undergo a rigorous selection process which evaluates their academic activities, SAT scores, class standings, and extra-curricular activities.

The awards were presented by representatives of top contributors to the Scholarship Fund.

Gulnur Avci is the daughter of Zubeyda and Ahmet Avci and will be graduating from Bangor High School. She plans to attend Columbia University with a major in electrical engineering and a possible minor in computer science or business. Her community and academic honors include the receiving the Congressional Award Silver Medal, Horvath Excellence in Science Award, and the Rensselaer Medal. During the college decision

process, she was also named a Hodson Trust Scholar at Johns Hopkins University and a Meinig Family National Scholar at Cornell University. She is the co-founder of Pyronix-a start-up that created a device called the PyroSleeve-and is the founder of the BHS LaunchX Entrepreneurship Club at her school. Her activities include Student Government Association, National Honor Society, playing the flute for the school's Symphonic Band, and volunteering at Moravian Hall Square Nursing Home. In addition to these, Gulnur spends a majority of her time preparing projects for the annual Technology Student Association regional and state conferences; she has several regional ribbons and is a four-time state finalist in video game design, digital video production, and animatronics. Gulnur has attended the 5-week LaunchX Entrepreneurship Summer Program at Northwestern University the summer of her senior year and a 6-month web development course during her junior year. In her free-time, Gulnur enjoys painting, playing the piano, basketball, and rapping.



Gulnur Avci with Nahi Khouri,
representing FLSmidth

Aaron Hammond is the son of Gerard and Sherri Hammond and will be graduating from Pleasant Valley High School. He plans to attend Georgia Institute of Technology to major in Aerospace Engineering. He was the Vice President and Co-Captain of his school's Science Club and Science Olympiad Team respectively, leading his team of peers to various victories in science

olympiad competitions, robotics competitions, and biology olympics. He also has been the president of his school's Math Honor Society for the past 2 years organizing meeting activities, induction, fundraising, and various events. He started the Entrepreneurship Club his sophomore year and is the National Honor Society treasurer at his school's chapter. He will be returning to FBLA Nationals in San Antonio, Texas this summer for his second time. He has received Academic excellence awards in mathematics, economics, and overall ranking in his class. In his time away from school associated activities and engagements he enjoys working at Blue Ridge Winery.



Aaron Hammond with Stephen Ressler representing ASCE

Seth Fine is the son of Harris and Sandi Fine and is graduating from Parkland High School. He is Class Treasurer, Treasurer of LEO Club, founding member of Aerial Technologies club, co-president of National Honor Society, and earned recognition as an AP Scholar with Honor. He has been a co-captain of the volleyball team for the past three years and has earned Parkland High School scholar athlete. Seth serves as the student representative to the district community advisory council and the president of FBLA where he placed 2nd in states in Entrepreneurship and then Top 15 at Nationals. Next fall, Seth will be attending the Massachusetts Institute of Tech-

nology to study Electrical Engineering and Finance.

Seth was not able to attend.

Alyssa Zack is the daughter of Randy and Julia Zack and will be graduating from Northwestern Lehigh High School. She is a regional medal winner on her high school's Science Olympiad Team. She was a two participant in the Math-Works Math Modeling Challenge. She is a member of Science National Honors Society and National Honors Society. Alyssa is the co-president of Fellowship of Christian Athletes, the treasurer of HOSA Future Health Professionals, a member of Key Club, and a volunteer peer tutor. She is a 4-year varsity athlete in cross country and track and was captain for both sports her senior year. This season Alyssa was named Northwestern's female MVP in cross country for leading her team to a third-place finish in the PIAA cross country state meet. She was awarded the Colonial League Academic All Star Award for her outstanding performance in athletics and academics. Other awards she has received include the Bausch and Lomb Science Award and the Allentown Rotary Club Student of the Month. After graduation Alyssa plans to attend Embry Riddle Aeronautical University in Daytona Beach, Florida where she plans to major in engineering. She is also continuing her cross country and track career at the collegiate level.

Alyssa was not able to attend.

Caterine Yunez-Cosme is the daughter of Wadid Yunez and Olga Cosme and will be graduating from Whitehall High School. She plans to attend Penn State University and major in Architectural Engineering. While at Whitehall, she was part of the Science Olympiad team, primarily as a builder, and medaled in various competitions. She is currently the President to the Science National Society and the Art Club, Vice President to Science Olympiad and Serve Club, and a member of National, Math, and English Honor Society as well as Fellowship of Christian Athletes and Student Forum. She serves in Lehigh County Youth Advisory Board as a youth liaison. She is a College Board Scholar and a Graduate of the National Hispanic Institute. She is a PA Governor School of the Sciences participant at Carnegie Mellon and published

research in Irregular Graph Theory alongside Professor Mary Radcliffe. She works part-time as a youth referee and a body artist. In her free time, Caterine volunteers at KidsLife, Teen Advisory Board at the WCPL and the Northampton Food Bank.



Caterine Yunez-Cosme with Janice Osborn representing PPL

There are no words to express the limitless depth of pity I feel for the ignorance before me, astonishing in its stark frankness, predicable as the sunrise, ever-expanding as the universe.

But Oh! So Fortunately, it is neither genetic nor contagious.
-Anonymous

I had to decide early in life, between dishonest humility, and honest arrogance, and I chose the latter.
-Frank Lloyd Wright

He has much to be modest about.
-Winston Churchill

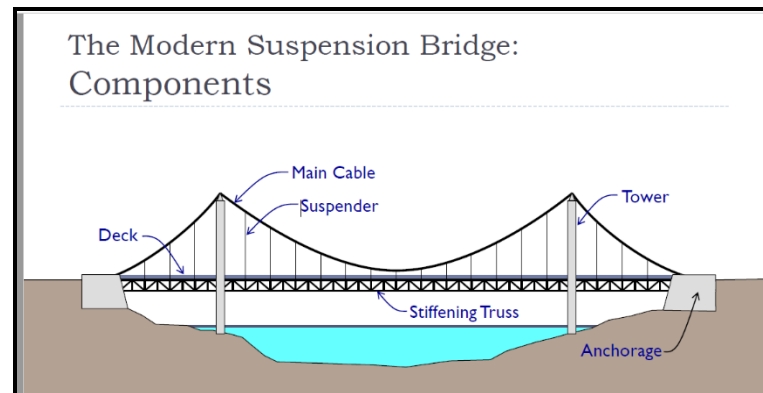
Suspension Bridges

Alfred Gruenke, PE

Bridges have been the most visible expression of engineering excellence since ancient times. Bridges connect two points, enabling peoples that were heretofore separated by time and space to interact. They have names and are referred to in hallowed tones. They are almost mystical in nature.

Bridge construction has evolved over the years, from the arches of Roman days to cantilevers and trusses and other variations. But all these designs were limited by the length of the spans between supports. Hence, the suspension bridge, a type of bridge in which the deck is hung below suspension cables on vertical suspenders. Simply put, two towers span the chasm. Cables span the towers and are anchored at both ends. The cable between the towers approximates a parabola.

Stephen Ressler, PE, PhD, Dist.M.ASCE presented the history of the suspension bridge to around twenty LVPSPE members and guests at Kingfisher American Bistro and Wine Bar in Bethlehem.



Dr. Ressler surprised us by revealing that suspension bridges built for vehicular traffic were actually invented and patented by James Finley, a minister and politician near Uniontown, southwestern Pennsylvania. His bridge spanned Jacob's Creek Bridge, and spanned 70 feet, with a width of 12 feet 6 inches. It was built in 1801 and demolished in 1833. He built or licensed forty bridges throughout the northeastern US.

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SCHOLARSHIP SPONSORS

A great way to be involved in the LVPSPE Chapter is to contribute to the **LVPSPE SCHOLARSHIP FUND**. Please Contact the Valley Engineer Editor to sponsor scholarships for the remainder of the calendar year.

If you would like to contribute in any amount – please send your TAX DEDUCTIBLE donation to PA ENGINEERING FUND. Donations should be mailed to:

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Please note “LVPSPE Scholarship Fund” on the comment line.

Or, you may also contribute via the LVPSPE website <http://www.lvpspe.org/Donations>.

Scholarship application is at <http://www.lvpspe.org/Scholarships>. Any questions regarding scholarships can be directed to

Alex Dezubay, PE
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Board of Direction Meetings

The monthly Board of Direction meetings are 6:00 PM on the second (2nd) Monday of each month. Open to all members; they are held at the office of Liberty Property Trust, 74 W. Broad Street, Suite 240, Bethlehem, PA.

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Congratulations to all of the LVPSPE scholarship recipients!

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There is a local connection to Mr. Finley's chain bridges. One crossed the Lehigh River at Lehigh Gorge near Slatington. Built in 1826, it was damaged numerous times but lasted 100 years. The main span was 48.8 m. The writer visited the site.



Lehigh Gap Chain Link Bridge, early 20th Century.
Note the single strand chain.
Photo courtesy of Chad Schwartz,
Director of Science & Education
Lehigh Gap Nature Center, Slatington, PA.

The bridge was located a couple of hundred yards south of the present Rt. 873 bridge across the

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Rt. 873 on the left, the remnants of the two towers (islands) and the toll house on the right.

Lehigh River. Nothing remains of the bridge except for the toll collecting building on the east side of the river. The towers were located on what are now two islands in the river.

There is a monument commemorating the bridge on the South-East corner of Palmerton Borough Park in Palmerton, PA. Erected in 1936, links from the original chain now form the fence around the monument. The plaque states that the links were forged in Little Gap, located six miles from the bridge.

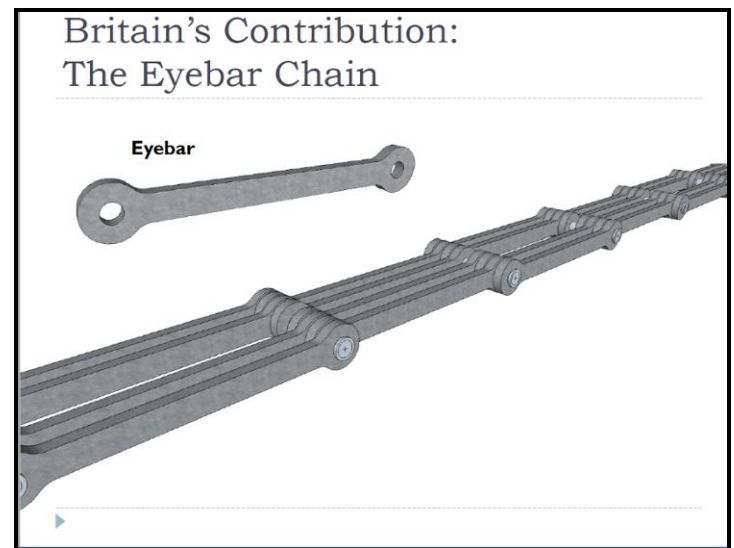


Monument to Mr. Finley's chain link bridge located in Palmerton, PA. Each link is eight feet long.

Unfortunately, the phrase "A chain is only as strong as the weakest link" led to the downfall of chain link bridges, figuratively and literally. Some of the failures were quite spectacular.

The British contribution to the evolution of suspension bridges was the eyebar chain. The eyebar chain had the advantage of increasing the number of parallel load-carrying members, greatly increasing the redundancy and capacity of the chain. It remained the model for British suspension bridges for fifty years.

The first eyebar chain bridge was erected in 1819. A few years later, Thomas Telford was commissioned to build a bridge to connect the island of Anglesey to the mainland of Wales across the Menai Strait. An added requirement was that the bridge had to be high enough to allow ship traffic in the channel. Telford's bridge was completed in 1823, with a span of 579 feet and 24 feet wide. The segments were soaked in linseed oil and later painted to prevent rusting. It was immortalized by Lewis Carroll in his — "Haddocks' Eyes", Through the Looking-Glass



White Knight to Alice:
 "I heard him then, for I had just completed my design,
 To keep the Menai bridge from rust
 By boiling it in wine."

The bridge was unstable in wind and had to be stiffened. It remained in use for over 100 years.

The French, meanwhile, not to be outdone by their British competitors, built their suspension bridges with steel cables. Five hundred suspension bridges were built with spans as long as 1,010 feet. Iron wire is stronger to iron plate, but the challenge was to ensure that tension was evenly distributed. If not, wires that were subjected to excessive tension could break, transferring the load to the next sequence of wires, and so on, until all the cables failed. There was also a problem with the French cable anchoring system, leading to corrosion of the cable at its point of attachment to the anchorage.

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This design flaw caused the collapse of Chaley's bridge at Angers, France, in 1850, effectively ending suspension bridge development in France for twenty years.

It is interesting to note that the British and French approach to bridge design differed radically. The French were more scientific, while the British were more empirical, and distained the French approach.

In the latter half of the 19th Century suspension bridge expertise moved to the US. Famous bridge engineer John Roebling combined the French cable systems with British eyebars, eliminating the anchor problems. Also, Roebling developed a cable installation technique that equalized the tension in the individual wires of the cables. His Delaware Aqueduct bridge between Minisink Ford, NY, and Lackawaxen, PA, is the oldest existing wire suspension in the United States. The John A. Roebling Suspension Bridge spans the Ohio River between Cincinnati, Ohio and Covington, Kentucky. When opened on December 1, 1866, it was the longest suspension bridge in the world at 1,057 feet (322 m) main span. It is still in use.

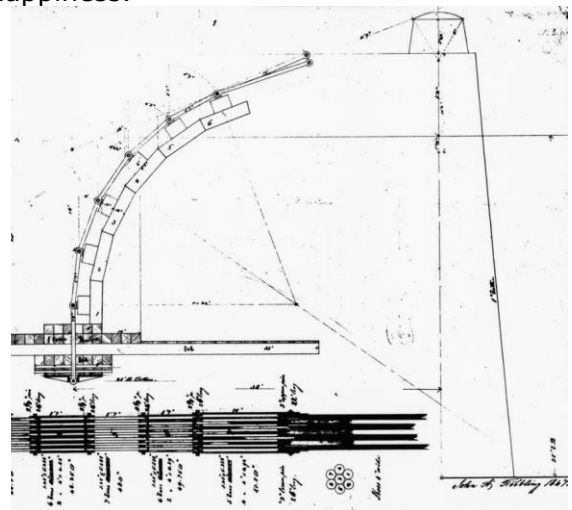
However, Roebling is better known as the designer of the Brooklyn Bridge. The main span has a main span of 1,595.5 feet and a height of 276.5 feet above mean high water. For many years all US Navy ships had to meet two criteria; they had to be able to pass through the Panama Canal, and under the Brooklyn Bridge. Unfortunately, Roebling was injured during groundbreaking and died shortly thereafter. His son, Washington Roebling, became the Chief Engineer. He also was injured when he was subjected to the bends during construction of the towers.

An interesting sidelight. John Roebling invented a system of manufacturing steel cables, replacing the hemp ropes used on the Allegheny Portal Railroad (see Valley Engineer, November, 2015) and became rich. However, to ensure a squeaky clean process the New York and Brooklyn Bridge Company would not allow Roebling to use cables manufactured by his shop. He was forced to use someone else's cable, which turned out to be inferior. Fortunately, later studies determined that the inferior cable was sufficient

Dr. Ressler pointed out a feature of suspension bridges that may be considered outside engineering. Suspension bridges are beautiful. Elegant in their simplicity, they soar in the air, as graceful a bird in flight.

Mark Twain's comments about Roebling's Niagara Falls Bridge of 1855 were less flattering.

"You drive over the Suspension Bridge and divide your misery between the chances of smashing down two hundred feet into the river below, and the chances of having a railway-train overhead smashing down onto you. Either possibility is discomforting taken by itself, but, mixed together, they amount in the aggregate to positive unhappiness."



John Roebling's anchoring system. The Brooklyn Bridge required more than 10,000 back and forth trips to string the cables.



The Brooklyn Bridge. "A thing of beauty is a joy forever".

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In the late 1800s there was a concerted effort to design suspension bridges using more mathematical analysis.⁵⁷ One result is the Williamsburg Bridge, also across the East River in New York. It was designed using a technique called the Elastic Method and was completed in 1903. With a span of 1,600 feet, it was the world's longest span until 1924.

The Williamsburg Bridge has another distinction. Whether by design or lack of artistic vision, this bridge has been described as "The heaviest, clumsiest suspension bridge which has been or probably ever will be erected".



"A bridge for bovines"



Note anchoring system. In times past, vines were used instead of steel cables.



Williamsburg Bridge, connecting Manhattan and Queens

An advocate of engineering analysis was Leon Moisseiff, who applied Deflection Theory in the design many of the suspension bridges in the early 20th Century, including the Tacoma Narrows Bridge (1940), which he described as "The most beautiful bridge in the world". More on the Tacoma Narrows Bridge later. The most striking characteristic of the Tacoma Narrows Bridge was its slenderness—a direct result of the application of Deflection Theory.

Suspension bridges are not all engineering marvels, soaring majestically high above the waters. Some are relatively simple to build, hence can be found in remote areas of the world that have little vehicular traffic. A friend of the writer, Evan Klofach, contributed the following photos from Nepal. Even though cattle are pictured, Evan assure me that he walked across this bridge with only a little trepidation!

One cannot discuss suspension bridges without mentioning the failures, some spectacular. Earlier bridge designs were not concerned with wind forces because they had relatively short spans. Suspension bridges were much longer and higher, hence subject to aerodynamic forces, which thrust this seemingly unconnected discipline into the forefront of bridge design. It has been the leading cause of bridge failures in the last century. Many of the world's suspension bridges have added stiffening trusses, supplemental bracing, or aerodynamic enhancements to counteract the effect of wind, including the Golden Gate Bridge

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The Tacoma Narrows Bridge stands out as an example of failure due to not taking wind loading into consideration. The writer has seen a video of the collapse, and it is spectacular! This bridge was designed and built by Bethlehem Steel. In the 1960s the writer went to school with people from Bethlehem Steel, and that failure was part of the corporate lore. The "official" explanation was, they did not solve the differential equations past seemingly "trivial" solutions. Sounds good to me!

The search for better bridge design continues, both empirical and theoretical.

Closing Thoughts:

Lessons from Roebling:

The design process should be driven by fundamental principles (strength, ductility, redundancy), not by available analysis tools. Science-based analysis cannot substitute for experience.

Lessons from Moissieff:

Hubris is a liability in engineering design. Those who fail to learn from history are doomed to repeat it.

Lesson from Finley:

Justices of the Peace should not design long-span bridges.

We thank Stephen Ressler, PE, PhD, Dist.M.ASCE, for an insight into a world many of us can only marvel at.

Nostalgia isn't what is used to be
-Dr. August Polinske, PE, PhD, LLD

What is prudence in the conduct of every private family can scarcely be folly in that of a great kingdom
- Adam Smith

I'm generally seen as the father of the Mustang, although, as with any success, there were plenty of people willing to take the credit. A stranger asking around Dearborn for people who were connected with the Edsel would be like old Diogenes with his lantern searching for an honest man. On the other hand, so many people have claimed to be the father of the Mustang, I

wouldn't want to be seen in public with the mother!

-In "IACOCCO, AN AUTOBIOGRAPHY", by Lee Iaccocco

Human beings, who are almost unique in having the ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so.

-From the Sedona Excentric, June 1998

The majority of the senior class of Vassar does not desire my company and I must confess, having read specimens of their thought and sentiments, that I do not desire the company of the majority of the senior class of Vassar.

-Bill Buckley

Pants is short for Pantaloons. Years ago, pants came in two pieces, one for each leg. Hence, two became a pair of pants. They were tied together at the top, similar to cowboy's chaps

Do not wear courtesy as a watch, to be taken out now and then when you want to impress people. Be courteous always, wherever you go, with whomever you happen to be.

-Sister Mary Mercedes

Most of us miss out on life's big prizes. The Pulitzer. The Nobel. Oscars. Tonys. Emmys. But we're all eligible for life's small pleasures. A pat on the back. A kiss behind the ear. A four-pound bass. A full moon. An empty parking space. A crackling fire. A great meal. A glorious sunset. Hot soup. Cold beer.

-Anonymous

With hurricanes, tornados, fires out of control, mud slides, flooding, severe thunderstorms tearing up the country from one end to another, and with the threat of swine flu and terrorist attacks.

Are we sure this is a good time to take God out of the Pledge of Allegiance?

-Jay Leno



Lehigh Valley Chapter
Pennsylvania Society of Professional Engineers
Lehigh, Northampton, Monroe and Carbon Counties

Minutes for the September 9, 2019 BOARD OF DIRECTORS MEETING

6:00 pm at the Office of Liberty Property Trust - 400 Boulder Drive, Suite 200, Breinigsville, PA 18031

Attendees: Jeff Kutz, Chris Williams, Al Gruenke, Al Dezubay, Mary Rooney & Peter Staffeld (phone)

I. Call to Order: Alex Dezubay called the meeting to order at 6:00 PM

II. Programs:

- Activities – Jeff Kutz
 - September: PSPE State Convention
 - December: Holiday Party
 - February: Engineers Week
 - May: Chapter Banquet
 - All discussed possible event/tour locations for Oct, Nov, Jan, Mar & Apr: National Museum of Industrial History, Weyerbacher Brewing, Just Born, Atlas Machining & Welding, Lutron, Victaulic, Dorney Park, Bosch Rexroth, Bimbo Bakery, a warehouse (location TBD) and possibly a presentation on drone/scanning technology.
- Newsletter – Al Gruenke
 - Al is happy to serve as VE editor.
 - Nearly finished with the newsletter, plans on finishing by end of week.
 - Newsletter features president's message, installation of officers from May and a summary of Steve Ressler's bridge presentation.
- Open committee position – Membership Outreach
 - Al D. mentioned it might be beneficial to nail down a simple way of explaining the benefits of becoming a member in the organization and the organization's purpose.
 - All discussed protecting the value of the PE license, tours/PDH opportunities, supporting engineering scholarships and supporting MATHCOUNTS.

III. MATHCOUNTS:

- No update

IV. Lehigh Valley EOY/YEOY & Scholarships

- Fundraising – Frank Walsh
 - Will get started soon.
- Scholarships – Al Dezubay
 - Need to finalize committee members.
 - Usually contact schools in January with applications due in March.

V. Treasurer

- Treasurer Report – Ray Szczucki
 - All reviewed the email that Ray provided prior to the meeting which included the following:
 - Wells Fargo statement
 - Wild Apricot additional fee of \$194.40 if we keep PayPal in lieu of switching to AffiniPay
 - Miscellaneous transactions

VI. State Director

- State Director Report – Peter Staffeld
 - Convention is coming up on 9/19-9/20
 - Banquet Friday night is only \$60 per person. Consider attending and supporting the organization and Mike Basta.

VII. Past President

- Past President Report – Brian Kutz
 - No report.

VIII. Old Business/New Business

- Social media
 - Currently the Chapter has only a LinkedIn group.
 - Jeff volunteered to pursue setting up a LVPSPE page on LinkedIn. We can post events here, advertise for EOY/YEOY submission, etc.
- Wild Apricot/PayPal changes:
 - Wild Apricot is now using AffiniPay - a third party who processes monetary transactions, in lieu of PayPal.
 - Keeping PayPal is an option, but additional fees (\$194.40/yr) would be incurred.
 - The board reviewed Wild Apricot's website and determined that a change to AffiniPay would likely have no negative impact to how transactions are done.
 - All were in favor of switching to AffiniPay, on a motion by Chris, seconded by Al Gruenke.
- Junk emails coming to LVPSPE email accounts:
 - Mary discussed the concern of receiving a significant amount of junk email through her LVPSPE account.
 - Currently email addresses and names are listed on the website.
 - Peter explained that the board email addresses are set up separately from the chapter website.
 - All discussed possibly using a generic contact form or having members log in to see contact info. Will continue discussions on this item in the future.
- EOY/YEOY
 - Al D. will discuss the selection process with Brian Kutz.
 - Al G. mentioned that scholarship donation requests have also included solicitation for EOY/YEOY nominees.
 - Jeff recommended using LinkedIn to solicit nominations.

- Board of Directors meetings for the 2019-2020 year:
 - September 9th
 - October 14th
 - November 11th
 - December TBD – Holiday Break
 - January 13th
 - February 10th
 - March 9th
 - April 13th
 - May TBD – LVPSPE Scholarships and Installation of Officers Banquet

IX. Adjournment