

Engineers' News

October 2018

Vol. 81 No. 2

www.FortWayneEngineersClub.org



Find us on 

October Tour



[Bolt Custom Sleepers](#)

[3900 Transportation Drive, Fort Wayne, IN 46818](#)

Thursday, October 18th at 6:00 PM

Competitors of Bolt Sleeper are NOT welcome on this tour. Both Bolt Sleeper and Fort Wayne Engineers Club reserve the right to exclude anyone from this tour.

Requires enclosed shoes with good traction, and long pants or slacks. No shorts, skirts, or dresses.

Bolt Sleepers designs, builds, and installs blended aerodynamic "sleeper boxes" behind the driver's seat of semi-tractors for interstate travel. These have been rapidly evolving to accommodate more rest time (Federal regulations), traveling with a spouse (who might or might not also drive), specialty needs (shelter and care for work crews, etc.), and more. Changing cultures and shortages of drivers encourage longer and better-equipped designs for more sustainable lifestyles and relationships.

Tour News

The Experimental Aircraft Association, Chapter 2, will have a chili lunch fundraiser in the historic Smith Field hangar (426 W. Ludwig Road) on Saturday, October 13, from 11:00 am to 2:00 pm. \$7/person. Aircraft and cars should be on display, and active EAA members on hand if you wish to chat. Chapter 2 wants to include children.

City Utilities will have an Open House of the Water Pollution Control Plant on October 20 anytime 10:00-noon. An Open House at the Filtration Plant will be October 27, 10:00-noon. Both are free. Children very welcome.

TekVenture relocated to 1550 Griffin Street, near the Hosey Dam. They expanded activities including theater, woodworking, and an active Fort Wayne Inventors Club (also potentially helpful if interested in patent law). Most activities intended for all ages.

Travelers may be interested that the **World War II atomic bomb Trinity site** has Open Houses twice a year, the first Saturdays of October and April anytime 8:00 am to 2:00 pm with everyone out by 3:30. The website www.WSMR.Army.Mil/trinity/pages/home.aspx has various videos of current information (beware copycat sites and National Park Service or NPS).

November Tour

November Tour - Hobby, Job, and/or Career Opportunities In Machining.

(Editorial note: Please think about bringing young people and spouses. This has endured as a flexible, well-paid, and healthy long-term income opportunity even during the 2008 recession, sometimes offering paid on the job training. Age or gender have not been much of a factor, including spouses with empty nests.)

November's tour 6:00 pm, November 15, 2018. Open to all.

Gordon Tool, located 16 miles east of I-469 at 1301 State Route 49, Payne, OH 45880.

Anyone interested in Machining, Design, Engineering, or any other mechanically oriented line of work will find this worthwhile. It is intended to be an educational tour for anyone regarding the fields of Tool & Die, Design, or Engineering.

Gordon Tool is a small privately held Machine Shop. The tour will encompass the advantages of and challenges of manufacturing both prototype and small run parts used in all areas of the American economy. Parts produced at Gordon Tool can be found in ambulances, Olympic ski-sled, mold or progressive dies used to manufacture any variety of consumer product. Skilled tradesmen at Gordon Tool take pride in their abilities to produce high-quality parts from engineering drawings provided by customers. This evening will include the machine shop with a number of CNC machines including Mills, Lathes, Wire EDM, and Water Jet.

December Open House

An **Open House** (come and go as you please) informal social is being planned for Saturday, December 8, from probably 4:00-8:00 pm at the Rod Vargo and Joan Woerner home in Ludwig Park. Expect pizza, a woodstove aglow, and a lifetime of collected curiosities. Suggestions welcome (416-0986).

Annual Membership Dues



It is Dues time again! \$5 for students and \$10 for non-students, plus another \$1 if paying online (FortWayneEngineersClub.org). Checks made out to "**Fort Wayne Engineers Club**" may be mailed to **Ryan Stark, 828 West Oakdale Drive, Fort Wayne, IN 46807**. The typical annual reminder cards were not mailed yet because of transitions with duties of Secretary, Editor, and Treasurer. Thank you, sincerely, for supporting a year's worth of tours, newsletters, and special activities. A lot gets done at \$5 and \$10. Fort Wayne Engineers Club is a nonprofit 501(c)(6).

FY19 FWEC Board Opening



The FWEC is looking for a Vice-President for the FY19 (2018-2019). Board positions are crucial to the planning of tours and events for the FWEC. Please consult the [FWEC constitution](#) or contact us at info@fortwayneengineersclub.org for information on specific duties on board positions.

FWEC roster for FY2018-2019

Proposed FWEC roster for FY 2018-2019:

President: John Magsam

Vice President: Open and under discussion; comments and suggestions welcome.

Treasurer: Ryan Stark. (260) 456-0809

Treasurer Trainee: Volunteer needed.

Secretary: Marna Renteria. (260) 744-3407

First-year Board Members: Volunteers needed.

Second-year Board Member: Dave Gordon. (260) 693-2167 Morgan Miller.

Third-year Board Member: [Rod Vargo](#). (260) 416-0986 Craig Welch.

Editor of Engineer News: [Maruf Ahmad](#). (260) 804-7821

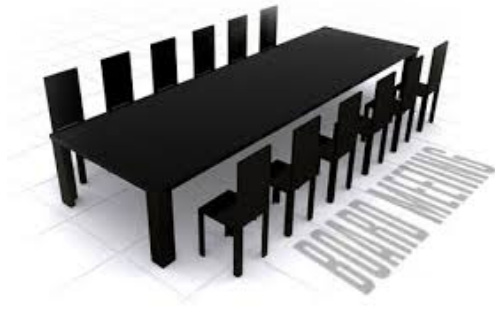
Membership and Contact Chair: Dave Schaller. (260) 486-7610

Northeast Indiana DiscoverE Chair: Rob Cisz. (260) 435-0409

Sincere thanks to outgoing Officers and Board Members: Bharat Rajghatta, Elizabeth Garr, Ellsworth Smith, and Jon Cook.

PLEASE CONSIDER STEPPING UP INTO ONE OF THE OPEN POSITIONS. Most require very little time. The economy is booming, so tasks are being distributed across more people. The outgoing individuals are experiencing increased demands outside FWEC. Historically, Board Member ages range from high school through retirement. Participation tends to return more than it takes.

FWEC Board Meetings



Fort Wayne Engineers' Club board meetings are open to all FWEC members. The next FWEC board meeting will be on Tuesday, November 6th at 7:00 PM. Board meetings are held on the [Indiana Tech campus in the Academic Center](#) in room ACC-201.

September Tour Summary

TOUR OF THE MAIN WORKSITE FOR DEEP-ROCK TUNNELING PROJECT (MAMAJO).

Thirty-seven members and guests toured the main worksite for the deep-rock tunnel-boring machine ("Mamajo") while the site was active but Mamajo still mute and in sections aboveground. Our host was the Senior Program Manager on this project for City Utilities, TJ Short, PE. It is located north and northwest of Dwenger x Glasgow Avenues, on the western border of Fort Wayne's regional Water Pollution Control Plant. The area had to be demolished, leveled, extensively paved, fenced, and reconfigured for this roughly \$200 million dollar project, the most expensive in Fort Wayne history.

Our April 16, 2016, report is available online and provides the how's and why's of this project. Briefly, Fort Wayne must eliminate most sewage overflows into its rivers. Proposals using conventional sewers were often stymied by existing land uses. This was especially true in older locations draining towards the St. Marys River. So, those surface overflows are being consolidated into conventional sewer interceptors which will connect to vertical shafts above the deep-rock tunnel. The nearly five-mile-long deep-rock tunnel will be bored roughly under the river and gravity flow (0.15% grade) to the Water Pollution Control facilities.

Deep-rock boring and associated projects have become successively much less experimental and therefore much less expensive over the last decade. For instance, it is currently feasible to remove the boring machine rather than leave it entombed

underground, which was the plan in 2016. Some of the reasons include: water intrusion from the limestone is better understood; a new and more modern (instead of refurbished) machine will be used; steel prices are now higher, so residual value higher; and components are more standardized and interchangeable, so used parts more marketable after the tunnel is completed.



Mamajo was arrayed on the ground in eleven segments, roughly rectangular but capable of fitting within the final tunnel diameter of 16 feet. These segments will often be open on the sides, top, and bottom of the concrete-lined tunnel. Each appeared to be up to 45 feet in length and will be connected underground into a flexible train, plus two head sections including a rotary cutting head.

Most segments ride on units resembling the road wheels of military tanks (solid rubber on steel rims), except Mamajo's are positioned with controllable hydraulic cylinders. Each road wheel can be nearly 2 feet wide and mount 2 or 3 solid rubber tires side-by-side across that width.



This 19-foot rotary cutting head will work by rotating at the front of the 420 foot-long articulating train, much like the head on a long worm. The white rollers in this cutting head will crack and break the rock. Tension on these rollers is such that I could not rotate them manually. The blue part will grind and crush the pieces into gravel. It will be lubricated with a slurry of Bentonite clay in water. The slurry with crushed gravel will flow through large crevices (between the white or blue "teeth") into a large space behind the cutting head. From there, it will be moved downgrade to the end of the tunnel. Pump(s) will push it to the surface for separation of gravels (two size grades, for use in later City projects), Bentonite clay (for reuse at the cutting head), and water (to be treated as sewage).

The separation process will utilize gravity flow through various sieves in a four-story structure already built onsite for the purpose. Bentonite has a finite useful life and fresh clay will be added as needed.

The rotary section and a following second section will work together to provide forward motion (hydraulic rams, max 5 feet/hr), laser-guided directional control (well within an inch), slurry handling, monitoring of water/gas intrusion, monitoring of rock conditions, and more. They will facilitate reduction of tunnel diameter to 16 feet. It will house a human "driver" for oversight but be largely guided by electronics. These lead units will have to counteract the rotation forces of the cutting head.

Immediately behind the cutting and removal activity, six prefabricated cement panels will be slid in place to form a cement tube. Each panel will be similar and 12 inches thick. The first will be the bottom section or "invert". Invert is the term in civil engineering for the critical elevations along the inside bottom of a pipeline, which

must remain permanently accurate for acceptable gravity flow, reduced sedimentation, and other design characteristics. Four side panels will follow. A "keystone" panel will be slid into the remaining slot at the top. Finally, a thick Bentonite grout will be injected in any remaining space between the tube and raw limestone.

Invert elevations will be 175-225 feet below ground. This will be 110-150 feet into the rock strata and entirely within Wabash Dolomite (= dolomitic limestone). The most dangerous phase of the project is now, before a side passage shelters workers from objects falling down the deep shafts.



This picture shows four sections lined up as they will appear underground. Note light

rails on the floor for carts, such as handling prefabricated panels. The large stainless steel tube in the upper left is for normal fresh air supplies.

One of Mamajo's sections includes a narrow emergency chamber (on left in picture) just long enough to seat 12 workers with enough water and breathable air to sustain them for roughly 48 hours. The primary risks are gases in the rock or electrical fire. Mild odors from rocks in the two vertical shafts were acceptable throughout our time at the site.

Three electrically driven locomotives were discussed, designed for mines, will be used to shuttle from the main worksite to Mamajo as the tunnel becomes longer. A conservative amount of used light rail components nearby included medium-duty preassembled rail/tie sections, what appeared to be eight-foot-long flatcars on two simple axles and roughly twenty-foot-long flatcars on light-duty bogies.

Much equipment onsite was European, reflecting the lead contractors on this project and their often pre-existing equipment. Contractors were selected by low-bid after a pre-screening process by City Utilities tailored to our specific project conditions.

Reducing the number of bidders was necessary to make it worthwhile for competent contractors to gamble a quarter million dollars in time and expense to assemble these complex bids.

Mamajo was made in Germany and its segments sent in pieces by ship. Most segments entered via the Chesapeake Bay and were trucked from there. The cutting head and second section were too large and heavy. Those two sections could get here only through the St. Lawrence Seaway, Great Lakes, and a specific dock (Arcelor-Mittal Steel) in Burns Harbor, Indiana. Getting them overland from Burns Harbor by truck was challenging.

This worksite has two shafts as much as 220 feet straight down, which will include the sump location and its permanent pump installations. One shaft is 66 feet in diameter and the other 33 feet. The worksite has two cranes, on crawler tracks for mobility, with the largest capacity being 80 tons. These raise and lower loads such as workers in cages, equipment including conventional excavators, and containers up to 27 cubic yards for solid waste. Electrically driven fan units, roughly 4 feet in diameter by 16 feet long, duct fresh air to the bottom. Eventually, groundwater and waste from Mamajo will be pumped up and out by the permanent electrically-driven systems intended for long-term tunnel service. A three phase substation was installed for the worksite but final needs are subject to change.

All water from the shafts (presumably portable pumps for now) is already processed through a series of worksite settling ponds before going into Fort Wayne's Water Pollution Control system. A four-story structure for separating Mamajo effluent into reusable components has already been described. Additional structures already in

place include a permanent building for central administration, teaching/meeting space, medical, and similar functions. Others include a large safety office trailer (well supplied) flanked by three large storage trailers, many specialized tool storage/shipping containers, an onsite overnight accommodation, and a "tent" of perhaps 4,000 square feet with high clearance entries for heavy equipment maintenance. Substantial reinforced concrete pads were in place or being prepared along the perimeter of the work site.

Our entourage heavily quizzed TJ Short regarding environmental and failsafe details and seemed favorably impressed. Fort Wayne's sewage is unlikely to enter the surrounding groundwater for multiple reasons. Design of tunnel liners is well known and regulated from decades of experience and legal oversight. Water pressure from many feet of water table elevation in the limestone should always greatly exceed pressure inside the tunnel's tube. Among other design features, elevations at the Water Pollution Control Plant are well below key levels at upstream vertical shafts, so this lower end of the tunnel will naturally overflow to some extent regardless of pumps. (Ed.: The overflow feature is primarily intended to conserve electric power, assist progress towards a self-sustaining Pollution Control Plant.)

Fort Wayne's tunnel has a smaller diameter, resulting in much less capacity (40 million gallons), than most sewage tunnels elsewhere because it is explicitly not intended for storage and is fitted with sufficient pumping capacity (1 billion gallons/day) and back up to keep it emptied under conceivable circumstances. Fort Wayne is highly unusual in having invested in extensive surface storage decades ago and having invested millions over the last decade for managing and treating that surface storage. This arrangement effectively eliminates sedimentation problems in the deep tunnel, effectively eliminates erosion of cement by sewer gases, promotes venting of the tunnel by natural air flow, seriously facilitates inspections (especially now that small drones are commonplace), and allows controlled purging of sediments from our large (≈11' diameter) regional sewer interceptors. (Ed.: Mayors and City Councils have been frugal but committed long-term to Fort Wayne's City Utilities and Public Safety components, almost uniquely so.)

Leakage of groundwater should not lower water tables because surrounding water table volumes overwhelm the tunnel's capacity and plausible infusion rates. City Utilities operations are computer and staff monitored 24/7. (Ed.: Other considerations not included here to shorten this report.)

Many of our participants were unaware of standard tag-in/tag-out practices, so are summarized here. This system is mandatory and taken deadly seriously in mining, industrial construction, and many other settings where individuals can disappear without a trace. Each authorized person on the site has a hook with two metal tags. All hooks are organized on a 4' x 8' plywood panel on display under a roof, prominently located outdoors. All authorized individuals are required to take one of

their metal tags upon entering the worksite, display it prominently on themselves (often on their hard hat), and return it as they leave the site. The system provides an instant display of who needs to be accounted for in emergencies and/or scanning of who should normally no longer be on site at any given time. Immediate work stoppage and search procedures are typically mandatory. Draconian measures usually apply to first-time violators of the tag system, such as driving back to return their metal tag or responsibility for keeping worksite toilets clean until (often 1-2 years later) someone else errs. A second violation can mean automatic termination.

As discussed in 2016, the geology under Fort Wayne closely resembles the view at Hanson Quarry, about 3 miles southwest of Foster Park. An average 60 feet of overburden sits atop an average 10 feet of Traverse Limestone, then circa 40 feet of Detroit River Dolomite, and 60-130 feet of highly variable Wabash Dolomite. The floor of the quarry is in a 130-foot layer of Louisville Limestone, superbly consistent for tunneling but the extra depth would be substantially more expensive.

The Wabash layer is thick enough to provide a single rock stratum to tunnel in despite undulations and the 0.15% incline desired in the tunnel for drainage.

Tunneling will be slow and expensive because the concrete liner to control water intrusion must be put in place almost immediately behind Mamajo's drill head. The largest pore spaces should be the diameter of a human small finger, in fossil coral. This is manageable, expecting peak flows of 400 GPM but planning for 2000 GPM as normal operations. (Ed.: As discussed in our 2016 report, porosity estimates are based on many rock cores and pump tests. Dolomite displays different hydrogeology than standard limestone.)

TJ Short and City Utilities were extremely generous in providing this tour. We sincerely thank them!

FWEC Membership



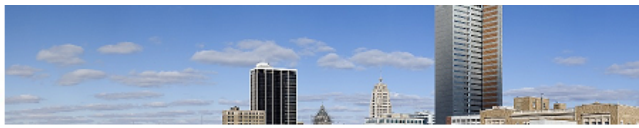
The FWEC exists through funding of its membership. Please forward your copy of the Engineers' News to prospective members and encourage their attendance at tours. Remember, the FWEC is the best deal in town, annual membership is \$10.

We offer free monthly tours September through May. Please be sure to recommend FWEC membership to your colleagues and friends.

Advertise in the Engineers' News

The FWEC provides advertising space within the Engineers' News. Advertisements are \$10 per issue and limited to ½ page of content. For submissions please contact info@fortwayneengineersclub.org.

Northeast Indiana Chapter Project Management Institute



October 24th Dinner Meeting - Effective Communications for the Project Manager by Clifford Clarke

Topic: Effective Communications for the Project Manager by Clifford Clarke



Abstract:

Communications is said to be one of the hardest things for an organization to get right. It is no easier for the project manager. In this interactive conversation, Mr. Clarke will explore common communication myths and the characteristics of effective communications. Participants will learn tips to improve their communication.

BIO:

Clifford M. Clarke is president of C² IT Advisors, a strategic information technology advisory firm providing consulting services in the areas of strategic planning, IT assessment and audit, project management, policy development, and governance. He serves as Executive Director of Computer and Technology Services for Ivy Tech Community College – Northeast Region, Fort Wayne, IN and is currently the Chief Information Officer for Public Technology Institute, Washington, DC, the only technology organization created by and for cities and counties to identify opportunities for technology research, to share solutions, and develop best practices that address the technology management, governance and policy issues that impact local government. He is a former Chief Information Officer / Chief Technology Officer for the City of Fort Wayne.

Date: Wednesday, October 24th, 2018

RSVP Deadline: Sunday, October 21st, 2018

Location: [Don Hall's GuestHouse](#), 1313 W Washington Center Rd, Fort Wayne, IN 46825

5:30 PM – Networking/Social

6:00 PM – Dinner

6:45 PM – Announcements

7:00 PM – Presentation

8:00 PM - Adjourn

- NEIC chapter members: dinner and speaker - \$20
- [In Jobs-Transition](#) or Student Membership - \$10
- Non-members: Dinner and speaker - \$30
- Speaker Only: \$0 (Members), \$10 (Non-Members)
- Pay now with credit card only; pay at door option is no longer available

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