

MISSOURI SURVEYOR

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Jefferson City, Missouri

March 2023

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CALENDAR OF EVENTS

2023

April 27, 2023

Board Meeting
Lodge of Four Seasons
Lake Ozark, MO

April 28-29, 2023

45th Annual Spring Workshop
Lodge of Four Seasons
Lake Ozark, MO

July 22, 2023

Board Meeting
MSPS Office, Jefferson City, MO

August 14-16, 2023

Review Course Jefferson City, MO

September 28-30, 2023

66th Annual Meeting and Convention
Oasis Hotel, Springfield, MO

December 4, 2023

Board Meeting
MSPS Office, Jefferson City, MO

Additional Dates for Spring Workshop

May 1-5, 2024
Lodge of Four Seasons
Lake Ozark, MO

Additional Dates for Annual Conference

October 3-5, 2024
Margaritaville Lake Resort
Osage Beach, MO

Cover: The Lewis and Clark Monument at the Katy Trailhead Plaza, next to the Missouri State Capitol in Jefferson City near the corner of Jefferson Street and Capitol Avenue. York, Clark and Druillard look over the Missouri River while Lewis sites the horizon and all are accompanied by Seaman the Newfoundland.

Donald R. Martin, Editor



Notes from the Editor's Desk

Donald R. Martin



There are times when putting together an edition of *Missouri Surveyor* happens to be a particularly pleasant experience. During such times as those it is motivating, it is fun, it may even be inspiring. Those times are good labors of joy which make for good editions of the newsletter. This issue, the March 2023 edition of *Missouri Surveyor* has again provided such a time. As is usually the case, it is because of fine contributions from fellow MSPS members.

Enriching the pages of this spring edition come offerings by the likes of Clickenbeard, Elgin, Govero and Paiva. Their efforts are tales and opportunities of developing and educating a new generation of surveyors – one of the most important tasks any surveyor can perform. Look within the pages of this issue for: *Some Geometry Problems* by Dr. Richard L. Elgin, *Escalating the Surveying Profession Through Education* by Joe Paiva and featuring Dan Govero and members of his team, and *Calculating Center of Section Without Programs* by Don Clickenbeard. They have shared some interesting lessons and their comments include some real gems. Check them out.

While these features come with effective problems and challenges for learning, it is this spirit of showing and sharing which sustains surveying's ranks and legacies. And speaking of legacy, don't miss the photo Dick Elgin sent of his father, the great Robert Elgin. You know, the way the younger Elgin generously shares his personal legacy of father surveyor to son surveyor with us all in Missouri surveying is a treasure. As is the photo within our pages, *Robert Elgin, Summer 1934*.

These articles, images and figures gracing our pages are most special because they are member submittals. Sort of *for us, by us*. I like to believe that *Missouri Surveyor* is a pretty good publication. But more than believe, I KNOW that *Missouri Surveyor* is at its very best when MSPS members draft and deliver the content in our pages. Thank you each for what you have placed in this periodical. And to all others, please know you too are welcome to join in the effort. This is your newsletter, and your thoughts, opinions, stories and news are always welcome.

Well, I best break-it-down and bunch-it-up so I can start getting ready for the next edition ...I'll get back with ya' then... 🇲🇴

Donald

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The Missouri Surveyor is published quarterly by the Missouri Society of Professional Surveyors, to inform land surveyors and related professions, government officials, educational institutions, contractors, suppliers and associated businesses and industries about land surveying affairs. Articles or opinions appearing in this publication do not necessarily reflect the viewpoints of MSPS but are published as a service to its members, the general public and for the betterment of the surveying profession. No responsibility is assumed for errors, misquotes or deletions as to its contents. Articles may be reprinted with due credit given.

President's Message

Ray Riggs, PLS



Robert Frost, in his poem *Mending Wall* relates how neighbors meet to “walk the line and set the (stone) wall between us once again.” It appears that the frozen-ground-swell of winter had caused the stones of this wall to topple in places. And since “good fences make good neighbors”, it is a mutual effort by these two neighbors to refurbish this artificial boundary. I have two thoughts on this classic Frost poem. In my experience, for neighbors to agree on a boundary and mutually work to maintain it, is somewhat unique. Secondly, the winter we’re having in the Ozarks is surely going to move some of those rebar, iron pipe and railroad spike corners around some!

Winter also brings some “moving and shaking” at the capital in Jefferson City. Three bills that in essence, address a singular issue, are HB47, HB638 and SB03. These bills are sponsored respectively by Rep. Haley, Rep. Mayhew and Sen. Bernskoetter. At issue is the replacing of the provisions of the Missouri Coordinate System of 1927 and the Missouri Coordinate System of 1983; with the “Missouri State Plane Coordinate System”. The MSPCS will then become the “official” State Plane Coordinate System for Missouri.

Jess Moss with the Missouri Land Survey Program has done an outstanding job working to get this system to approval stage by the National Geodetic Survey. He explained to me that the new system will essentially be two SPCS layers. One zone promulgated by NGS will cover the entire state and will be similar to the current NAD 83 UTM 15N. The other will be a 31 zone “Low-distortion” layer. These 31 zones were developed by grouping geographically similar counties into separate zones (i.e. mountainous, delta, prairie, etc.) One of these zones will be a “Special Purpose Zone” which will include the 4 counties that cover Kansas City, Missouri and 7 counties to the west in Kansas. In theory, the grouping of these zones virtually eliminates “Grid to Ground” conversions, when working within a zone.

I have been asked by several surveyors if this is “Good?” or “Bad?”. So, the following is my take on the issue; paraphrasing the ancient Greek philosopher Heraclitus, “The only constant in life is change”. With changes in technology and equipment, and more stringent accuracy requirements, an update/upgrade from the 27/83 system is necessary and inevitable.

On (almost) all the projects that I work on, the combined grid factor (CGF) is calculated and used. My Carlson software calculates the CGF and incorporates it in any necessary calculations. While the software does all the heavy-lifting for these calculations, it would be nice to “not have to worry about it” on most of the projects I do. The one drawback, as I see it, is having to upgrade software in programs and equipment to accommodate the new MSPCS. But I have been told, this can be accomplished with minimal difficulty and cost.

(continued on page 6)

Robert Elgin, Summer 1934

by Dr. Richard L. Elgin, PS, PE - Rolla, Missouri



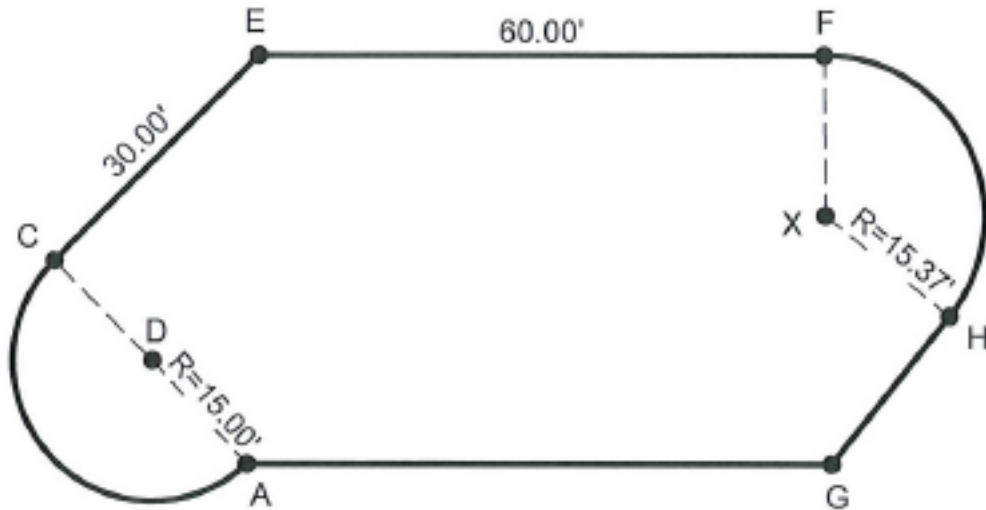
“The late Robert Elgin, summer 1934, while working as a rodman for the USGS. While a student at Missouri School of Mines (Rolla), Bob worked summers for the USGS. This photo was taken while working on the Green Bay Terrace quad sheet, Lake of the Ozarks region. He would graduate from MSM with BS Civil Engineering in May, 1937. He was in the surveying business for many years in Rolla and served as the Phelps County Surveyor for 36 years. He died in 2007. “

Some Geometry Problems

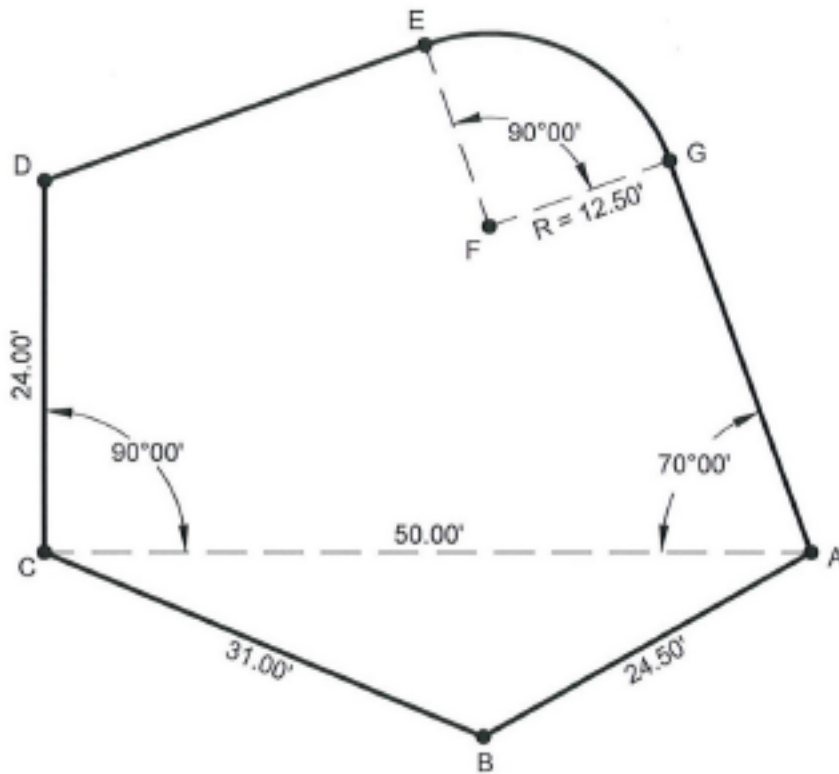
by Dr. Richard L. Elgin, PS, PE - Rolla, Missouri

Geometry problems are fundamental to surveying. They involve all aspects of the usual surveying calculation problem such as getting the “picture” of the problem in mind or sketched (somewhat to scale), understanding what is known and what is required, then applying algebra and trigonometry to reach a solution, then considering if the answer seems reasonable. Frequently the solution requires units conversions and an awareness of significant digits. Practicing solving geometry problems seems mundane today, but they are fundamental and should remain an important part of high school mathematics curricula. (IMO: If high schools taught more algebra, trigonometry and geometry and less AP calculus, college students entering surveying and engineering programs would be much better served!) So, here are some geometry problems to challenge those entering or beginning the surveying profession. Handwritten solutions are provided herein; see page 44.

- 1.) For the figure, compute its area to the nearest 0.01 square foot. Consider the dimensions given to be exact. Lines EF and AG are parallel and the same length. At C, line CE is tangent to the semicircle centered at D, with radius 15.00 feet. Angle FGA is exactly 90° . X is the radius point for circle sector FH. The radius is 15.37 feet. At H, line HG is tangent to the circle centered at X.



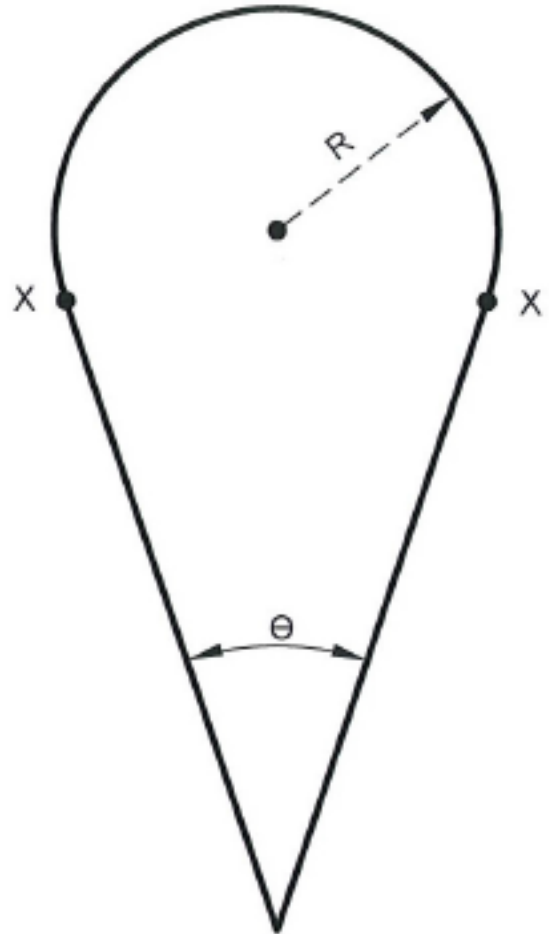
- 2.) For the figure, compute its area to the nearest 0.01 square foot. Consider the dimensions given to be exact. Lines GA and ED are tangent to the circle centered at F.



(continued on next page)

Some Geometry Problems (continued)

- 3.) For the figure, derive an equation for its area as a function of R and θ . That is: $\text{Area} = f(R, \theta)$. At X , the line is tangent to the circle. Reduce the equation to its simplest form. [To check your solution/equation, let θ be exactly 45° and R be exactly 100 feet. If your equation does not result in the area being 43,777.09 square feet, your derived equation is wrong.]



About Dick Elgin

Dr. Richard L. Elgin, PS, PE is a surveying practitioner, educator, researcher, collector and author. He authored the books *The U.S. Public Land Survey System for Missouri*, *Riparian Boundaries for Missouri* and *Shoulda Played the Flute* (memoir of his year flying helicopters in Vietnam). He coauthored the Lietz/Sokkia ephemeris and codeveloped the “ASTRO” celestial observation software products. Dick owns a large collection of early American surveying equipment, rides a Moots bicycle and drives a 1976 Alfa Romeo 1600 GT Junior. He can be reached at: elgin1682@gmail.com 🇺🇸

President's Message (continued)

We'll just have to wait and see about that.

As I finish writing this message, I am reminded that even dark clouds can have silver linings. While working south of Lampe, Missouri, my Chevy Colorado had severe brake problems. After locating a mechanic that could make the repairs in the morning, we also found a neat little retro-motel nearby. It may not have the amenities of a Hampton Inn, but the “Cruise Inn & Throttle Down Bar & Grill” has awesome food and the view of Table Rock Lake from the motel veranda is breathtaking!

And so, the *Adventure in Surveying* goes on... 🇺🇸

God Bless!

Ray



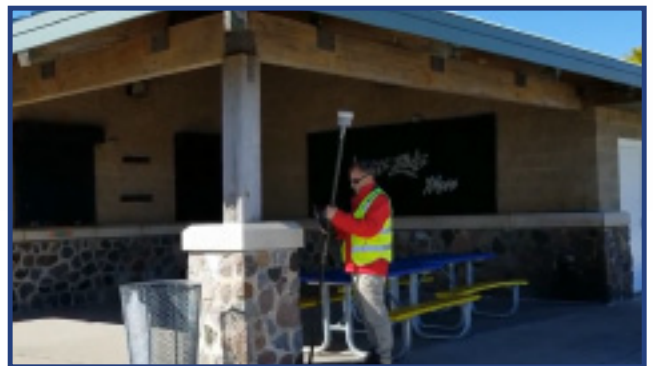
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The Noblest of Trades

by Angus Stocking, *The American Surveyor*, September 24, 2022



Combining in a single profession—in a single day’s work, sometimes—mathematics, law, field work, historical investigation and sundry other skills, land surveying is rightly called an art, and my father in art was a PLS and business owner in California, who hired me 35 years ago—partly out of pity I think—and trained me in this profession of ours, the noblest of trades. Ken, I soon realized, was one of the finest and most respected boundary experts in California, and his professional ethic was based on relentless pursuit of evidence and accuracy, Talmudic devotion to land law, clear thinking, blazing intelligence, and the sort of scrupulous, detail-oriented honesty that can be damned annoying at times.

I assumed for weeks that all land surveyors were of this character, as improbable and intimidating as that seemed. But as I gained experience I eventually realized (with some relief) that my mentor was, in fact, special; even in a profession noted for the probity and skill of its practitioners, Ken stood out. In retrospect, after years of practice in several states and comparing his professional ethic to that of myself and peers, I think of him as nearly a nonpareil among surveyors; so devoted to the art that he was uniquely excellent. He was certainly a fine mentor, and any excellence achieved in my own career(s) is due to him.

Be Like Ken

What made him that way, do you think? Was he just naturally smart and talented and virtuous, ‘born that way’ we might say? Or was there some external factor in his upbringing or adult life that forged his character into the sturdy, exemplary thing it was? I think Ken, had I thought to ask, would have pointed to his religion. For he was religious, fervently so, as was I... at the time. Ken was a lay minister in his congregation, a student of the Bible, and a skillful proselytizer. And at the same time, he was the best land surveyor I have ever known. For Ken, I think, those were not two facts about his life, but one fact.

I suppose it is obvious that the integration of spirituality and professional excellence has been an *idée fixe* of mine ever since I had the good fortune to be initiated into the art of land surveying by a master. I’ve followed that fixation into some strange regions; my first column for *American Surveyor*, for example, drew attention to (what I see as) the Kaballistic underpinnings of the PLSS, and I’ve written here at length about architect Christopher Alexander and my belief that

(continued on page 10)

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The Noblest of Trades *(continued)*

his books will someday read as reverently as scripture. Possibly I've gone 'round the bend;' allowed my interests and inclinations to overwhelm me and make it impossible to usefully communicate with my peers about an idea that I consider integral to our trade.

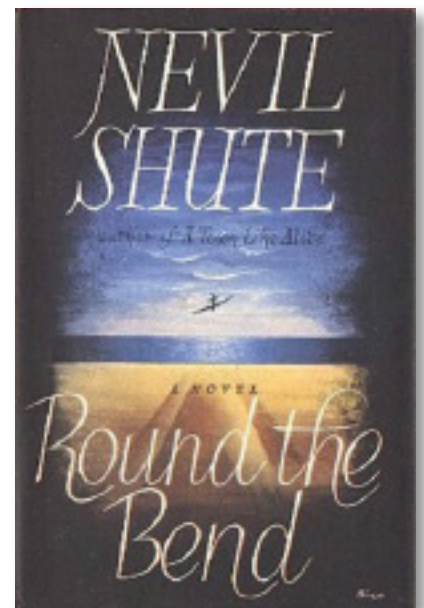
Fortunately, I know of a writer that addresses the topics of spirituality and professional excellence in a novel both entertaining and profound, written in plain, precise language that will be appreciated by anyone attempting make or maintain better infrastructure.

Round the Bend by Nevil Shute

Per Wikipedia, "Nevil Shute Norway (17 January 1899 – 12 January 1960) was an English novelist and aeronautical engineer who spent his later years in Australia. He used his full name in his engineering career and Nevil Shute as his pen name, in order to protect his engineering career from inferences by his employers or from fellow engineers that he was "not a serious person" or from potentially adverse publicity in connection with his novels." (emphasis added)

So, a serious and accomplished engineer—Shute was made a Fellow of the Royal Aeronautical Society for his work on military dirigibles and the Airspeed Courier—who was uneasy about his double life as a writer (I can relate). And a prolific writer, too; producing a book every two years or so, he published 24 novels (two, *On the Beach* and *A Town Like Alice* were bestsellers and became a movie and mini-series) and an autobiography.

Round the Bend was his personal favorite and might be the most loved by his admirers. On one level, it tells the quite interesting story of Tom Cutter, who catches the aviation bug in 1930's England, apprentices as an aviation engineer (a certified aircraft mechanic, basically), becomes a pilot too, does overseas military-related aviation work during World War II, and ends up starting an air cargo and transport business in Bahrain (Cutter is clearly a surrogate for Shute). But on another plane entirely—see what I did there?—Round the Bend is the story of Cutter's encounters with Connie Shaklin, who he befriends as a young man, and meets again as he is starting his business in Bahrain. In their years apart, Connie (also an aviation engineer) has become devoted to the art of aircraft maintenance to the point of religious fanaticism. Indeed, Cutter wonders if he's gone round the bend. Though Connie is certainly a superlative mechanic...



Two Passages from Round the Bend

As Cutter is considering hiring Connie, and worrying a bit about his spiritual beliefs, he asks his former employer for a reference:

"He's got some mighty strange ideas for an engineer," said Schafter. "It's a thing you ought to know about him since you're taking him on. About religion, and all that."

"Does it affect his work?"

"I'll say it does. It makes his work a whole lot better."

Connie begins to speak of spirituality in work to the Muslim mechanics in Cutter's hangar in Bahrain:

“But we are not like that, we engineers. We are men of understanding and of education, on whom is laid the responsibility that men may travel in these aeroplanes as safely as if they were sitting by the well in the cool of evening...

With every piece of work you do, with every nut you tighten down, with every filter that you clean or every tappet that you set, pause at each stage and turn to Mecca, and fold your hands, and humbly ask the All-Seeing God to put into your heart the knowledge whether the work that you have done has been good or ill. Then you are to stand for half a minute with your eyes cast down, thinking of God and of the job, and God will put into your heart the knowledge of good or ill. So, if the work is good you may proceed in peace, and if it is ill you may do it over again, or come to me and I will help you to do well before God.”

Spirituality in the Workplace



Two questions hover over all of Round the Bend: ‘What religion is Connie?’ and ‘Is Connie merely a spiritually inclined man, or is he, in fact, a prophet of God—or even actually God, walking on Earth?’ And these are questions I think anyone ambitious to do work might ask.

Answering the first of these, we see Connie working directly with Sikh, Muslim, Hindu, and Buddhist engineers, influencing them all and approached with reverence by the religious leaders of all their various congregations. But he remains fairly adamant that he himself is not a member of any particular religion. He encourages the placement of appropriate icons (for example, an image of the Buddha) in hangars, and observance of customs (such as daily prayers)

(continued on next page)

The Noblest of Trades *(continued)*

outside the hangars, in which he participates in a courteously detached way—during Islamic prayers, for example, he will kneel in meditation alongside the observant but does not go participate in ritual motions.

Less clear is the question of Connie’s divinity. He himself is ambivalent on the matter, usually stating plainly that he is not God. But as he gains a large following of reverent believers of all religions—who call him “the Teacher” and accept him as a prophet—he begins to entertain the idea, almost as if he is remembering who he really is.

Well, I do go on; if anything I write above strikes a chord in you, please read *Round the Bend* for yourself. It’s not an especially long or difficult novel, and your first reading be will quick and entertaining. Put another way, *Round the Bend* is a good investment of your valuable professional time, as much as any textbook or professional development hour... and at least as likely to make you a better land surveyor. 🇺🇸

Angus Stocking is a former licensed land surveyor who has been writing about infrastructure since 2002.

This article appears with permission from *The American Surveyor* (M. Cheves, Editor Emeritus); available as original publication at: <https://amerisurv.com/2022/09/24/the-noblest-of-trades/>



Spring Workshop 2023

April 28-29, 2023



Lodge of the Four Season • Lake Ozark, MO

All Surveyor’s and Technicians:

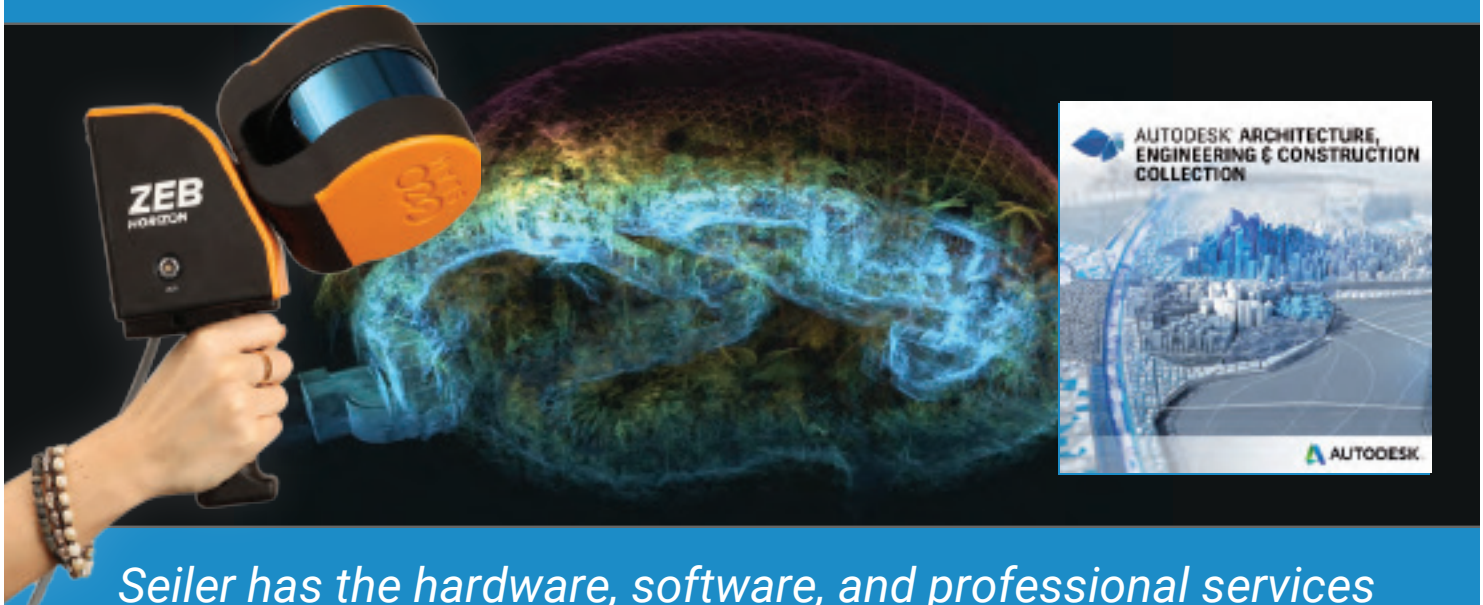
Be part of the Spring Workshop! Send in digital pictures of your truck used for surveying – include the inside of the bed layout of tripods, stakes, pins, cutting equipment, etc. Also pictures of what equipment you use for brush cutting, curb crosses, rock drills, etc., that you use every day.

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Glenville State University Professor Creates Tool for Land Surveyors

by Staff Reports, West Virginia's News, January 13, 2023



Jacob Petry, a lecturer of Land Surveying at Glenville State University, holds a copy of his invention – the Pathfinder: Directional Conversion Wheel.

GLENVILLE, W.Va. – The concept of geomagnetic secular variation – a gradual change to Earth’s magnetic field – is often tricky for surveying students to understand. However, its importance to boundary location is paramount as it affects magnetic compass bearings over time.

Historically, surveyors used compass observations as a basis for beginning boundary surveys. An individual who follows in the footsteps of the original surveyor would observe a different magnetic bearing today.

“I remember being told as a student that it was no reflection on our ability to learn, but some of us would understand secular change, and some wouldn’t – I fell into the second category. Then, after spending several hours working mathematical computations and trying to visualize two magnetic norths that varied slightly, the idea for the directional conversion tool appeared,” said Jacob Petry, a lecturer of Land Surveying at Glenville State University.

Petry realized that his invention – the *Pathfinder* – not only helped him but would also help other students and field professionals alike.

After a few months of conceptualizing the idea with his brother Kaleb, an Army pilot and expert land navigator familiar with circular slide rules, they created a prototype and filed a provisional patent application with the United States Patent and Trademark Office. The *Pathfinder* was recently sold to Builder’s Book, Inc., a California-based company specializing in educational materials for surveyors and engineers.

Builder’s Book is now selling the *Pathfinder: Directional Conversion Wheel* on its website.

They advertise the *Pathfinder* as a “simple analog tool” that “streamlines the reconnaissance process” for surveyors. The product information also notes that it is a helpful tool for student surveyors as it simplifies the understanding of secular variation without the need for advanced tools or specialized training.

“I’m proud of the *Pathfinder*, and seeing it on the market brings me joy. I believe aspiring land surveyors will receive as much help out of it as I have,” Petry added.

He is graduating with a Master of Science degree in Engineering Technology with a concentration in Surveying Engineering Technology from the University of Maine this spring. 🇺🇸

This article appears with permission from the *West Virginia’s News* (Editor, A. Knicely); available in its original format at: https://www.wvnews.com/news/wvnews/glennville-state-university-professor-creates-tool-for-land-surveyors/article_68186852-937e-11ed-a4c6-bfc8caf31382.html



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SOKKIA

Escalating the Surveying Profession Through Education

by Joe Paiva

Back in the day when Dan Govero started his surveying career, companies had a three-man crew, they measured with a steel tape, and hunted for original corner markers. Dan will tell you that while working under an experienced licensed land surveyor, he was taught how to find corner stones (original and newer), and how to calculate angles and directions and much more...he was taught how to survey.

Times have changed. Today we have many resources to conduct research and through mentoring, training, and education we not only give new people coming to the profession a job, but a chance at a real career!

What does it take to be a surveyor? We all talk about the training, education, and experience, but once licensed, what does it take to continue and to grow in that role?

Dan says, “As surveyors we must incorporate new people into the profession, mentor them and help educate them if the profession is to survive!” Dan also believes training is very important. Learning how to research records, find, and recognize monuments, and interpret the intent of conveyance isn’t taught in a classroom. This knowledge and much more is passed down from working and training under Licensed Professional Surveyors. By working on a survey crew, knowledge is passed down from the professional surveyor to the other members of the crew. Learning from an experienced professional is priceless!



Left Dan G & Josh S.



Dylan S., Josh S. & Dan G.

Dan Govero has been the owner and President of Govero Land Services, Inc. (Imperial, Mo.), for the last 35 years. He cares deeply about the future of the surveying profession. Dan is known to many of our readers for his service over the years as former President of the MSPS, Chairman, Education Committee for MSPS for 38 years (and still running) and former Member of the MO Board for Architects, Professional Engineers, Professional Land Surveyors & Landscape Architects.



Dan G.



Josh S. & Dan D.

One of the first things Dan will tell an employee wanting to pursue surveying is to get some trig under their belt. Surveying requires a good background in math, precision thinking, and working outdoors.

At Govero Land Services continuing education is encouraged for each of Dan's employees. Many former employees have gotten their start in surveying by working for Govero Land Services. Through the tuition reimbursement policy employees obtain reimbursement for a percentage of their tuition fees associated with the successful completion of undergraduate and graduate courses, as well as professional training and development.

The required surveying courses needed for licensure are available through State Technical College. Dan says, "they have an excellent program at State Tech."

This past summer Dan proctored the four field labs required for Surveying I for his employees and will also be proctoring the labs for Surveying II. Dan said, "We had five guys taking different classes at the same time. For one employee it was his final class, so now he's ready to take the LSIT test. Another one has one class left before sitting for the test. Two have several classes to go and one employee moved on to another employer."

(continued on next page)

Escalating the Surveying Profession Through Education (continued)

Dan believes State Tech's surveying program is an asset to Missouri, so much so, that he made a monetary contribution to help maintain the surveying program. Dan also donates to the Missouri Society of Professional Surveyors Scholarship Fund which grants scholarships for those pursuing an education in Land Surveying.




Josh S.



Dan G. & Dylan S.

A final word from Dan:

“As our profession continues to see a dramatic drop in enrollment while leaving our industry with an aging population of Licensed Surveyors, we must do everything in our ability to educate, train, and mentor the next generation of Surveyors!” 🇲🇴



Missouri Society of Professional Surveyors

Sandra C. Boeckman
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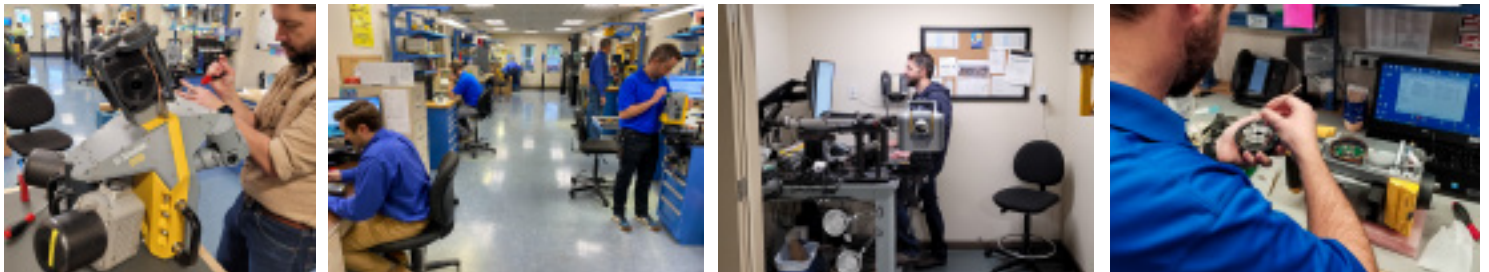
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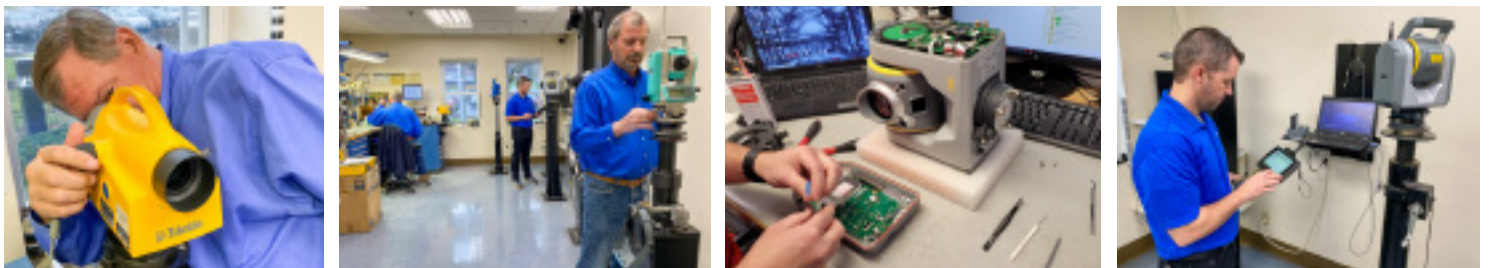
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Calculating Center of Section Without Programs

by Don Clinkenbeard

“An LSIT of my acquaintance asked me how to solve the Center of Section problem with only a scientific calculator while studying for the PLS exam.

“Being nearly a fossil myself, solving geometry with basic trig and algebra was normal. My attempt to explain it by phone on a Saturday was less successful with my young friend who has always had computer and field data collection devices to perform such calculations. I told him I would give him a procedure in a little bit. So, I prepared this instruction set. It does not contain any innovative math, but it came out pretty nice and should make learning the calculation reasonably simple.

“My friend the LSIT was delighted and found this easy to follow. After sharing a copy of these instructions with Dr. Elgin he recommended that I offer it for publication in Missouri Surveyor. This may be an aide to any LSIT studying for the PLS Exam or for any PLS mentoring such an individual. In reality, the PLS Exam may be the only time most working surveyors ever face this task with only a scientific calculator. Some of the older surveyors may find it to be trip down memory lane.

“To those reading these instructions, use or distribute them freely; consider them as being in the public domain. Feel free to publish it if you think it will be useful. Anything that gets us another “young surveyor” is good for the profession.

“Have a great day,

“Don Clinkenbeard”

CALCULATING CENTER OF SECTION WITHOUT PROGRAMS

Points labeled N, S, W & E are the already known Quarter Corners of any Section. You must know the Northing and Easting of all four Quarter Corners. Then the Center Section is calculated by Bearing-Bearing intersection on the straight lines between opposite Quarter Corners. This method assumes you do not have a program available for Bearing-Bearing intersections or an Inverse program for determining the Azimuths of the East-West and North-South Center Section lines. The Center Section is labeled C. Northing and Easting coordinates in formulas are labeled as N and E with a subscript of the point designation.



Typical Coordinate Labeling: (N_N & E_N = Coordinates of Point "N") & (N_C & E_C = Coordinates of Point "C")

Significant Digits: This is intended to yield coordinate results to nearest 0.01'.
 Carry Intermediate Distances or Coordinates to three places (X.xxx).
 Carry Angles and Azimuths to Nearest tenth of Second ($XX^\circ xx' xx.x''$) or
 To Seven digits in Decimal Degrees (X.xxxxxxx°).

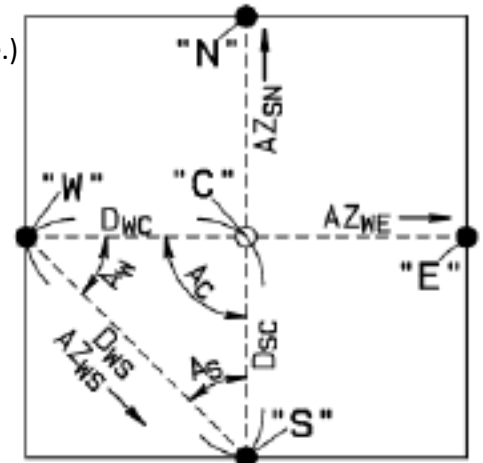
Step 1: (An Inverse Program could be used if available.)
 (Only need AZ_{WE} & AZ_{SN} if Bearing-Bearing program available.)

$$AZ_{WE} = \tan^{-1} \left(\frac{(E_E - E_W)}{(N_E - N_W)} \right) \quad (\text{If Negative Add } 180^\circ)$$

$$AZ_{SN} = \tan^{-1} \left(\frac{(E_N - E_S)}{(N_N - N_S)} \right) \quad (\text{If Negative Add } 360^\circ)$$

$$AZ_{WS} = 180 + \tan^{-1} \left(\frac{(E_S - E_W)}{(N_S - N_W)} \right)$$

$$D_{WS} = \sqrt{(E_S - E_W)^2 + (N_S - N_W)^2}$$



Step 2: (Calculate Angles) See Significant Digit note above.
 (Angles not needed if Bearing-Bearing program available.)

By Angle Addition or Subtraction calculate Angles A_C , A_W & A_S .
 As a Check, the sum of the three angles should equal 180° .

Step 3: (This relies on the Law of Sines.)
 (This step not needed if Bearing-Bearing program available.)
 Either D_{WC} or D_{SC} enables calculating the Center Section. Calculating both offers a check.

$$\frac{D_{WC}}{\sin(A_S)} = \frac{D_{WS}}{\sin(A_C)}$$

Therefore:

$$D_{WC} = D_{WS} \left(\frac{\sin(A_S)}{\sin(A_C)} \right)$$



$$\frac{D_{SC}}{\sin(A_W)} = \frac{D_{WS}}{\sin(A_C)}$$

Therefore:

$$D_{SC} = D_{WS} \left(\frac{\sin(A_W)}{\sin(A_C)} \right)$$



(OR)

Step 4: (Traverse using Azimuth and Distance along either Center Section line.)
 (This step not needed if Bearing-Bearing program available.)
 (A Traverse program could be used for this step.)
 Traversing in either direction will calculate the coordinates of the Center Section.
 Calculating both offers a check.

$$N_C = N_W + (D_{WC}(\cos(AZ_{WE})))$$

(And)

$$E_C = E_W + (D_{WC}(\sin(AZ_{WE})))$$

(OR)

$$N_C = N_S + (D_{SC}(\cos(AZ_{SN})))$$

(And)

$$E_C = E_S + (D_{SC}(\sin(AZ_{SN})))$$

New Year's Eve 2023 Marked the Retirement of the U.S. Survey Foot

by The National Institute of Standards & Technology, January 6, 2023

At the stroke of midnight on January 1, 2023, the U.S. survey foot was deemed obsolete and the international foot (i.e., 1 foot = 0.3048 meter exactly) definition officially superseded the U.S. survey foot. This retirement has been planned by National Oceanic and Atmospheric Administration (NOAA) and NIST for several years to provide national uniformity in the measurement of length. Prior to this date, several traditional linear, area, and volume surveying measurement units were only defined in terms of the U.S. survey foot. With this update, relationships are available in terms of the international foot (also known simply as the “foot”).

The preferred measurement unit of length in the United States is the meter (m) and surveyors, map makers, and engineers are encouraged to adopt the International System of Units (SI) for their work. To facilitate this transition, SI equivalents have been adopted and published in the Federal Register, online, and within NIST Handbook (HB) 44 (Appendix C, General Tables of Units of Measurements) and will be published within upcoming editions of NIST Special Publication (SP) 811, The NIST Guide for the use of the International System of Units and NIST Handbook 133 (Appendix E, General Tables of Units of Measurement). Surveying and mapping applications that use the “foot” and “meter” will become more prevalent over time. NIST OWM would like to recognize the significant contributions of Dr. Michael Dennis, Geodesist (NOAA, National Geodetic Survey) to revise these NIST publications to ensure the orderly retirement of the U.S. survey foot from the U.S. measurement system.

Why make this adjustment now?

The U.S. survey foot retirement corrects a measurement dilemma that has persisted for over 60 years. From 1893 until 1959, the yard was defined as equal exactly to 3600/3937 meter. In 1959, a small change was made in the definition of the yard to resolve discrepancies both in the United States and abroad. Based on this decision, the 1893 definition of the foot was named the “U.S. survey foot,” while the foot definition adopted in 1959 was called the “international foot.” At the time, it was mandated that the U.S. survey foot only be used for geodetic surveying and that it would ultimately be replaced by the international foot. The retirement of the U.S. survey foot facilitates the NOAA National Geodetic Survey modernization of the National Spatial Reference System, related datum updates, and supporting products and services improvements.

(continued on page 27)



The U.S. survey foot is obsolete. Only use for historical and legacy applications. Credit: NIST



NOAA employees conducting a geodetic surveying project (2017, Colorado). Credit: NOAA National Geodetic Survey.

Missouri Society of Professional Surveyors

SPRING WORKSHOP

April 28-29, 2023

The Lodge of Four Seasons
315 Four Seasons Drive
Lake Ozark, MO 65049

Attendee Registration

SPEAKERS

Robert Bailey, Robert Bailey Sales Consultant
Eric "Ric" C. Harris, J.D., Harris & Harris, P.C.
Panel of Business Owners and Industry Professionals

Friday, April 28, 2023

- 7:00 am REGISTRATION OPENS
- 7:00 – 8:00 am BREAKFAST BUFFET (included with registration)
- 8:00 – 10:00 am **PANEL DISCUSSION: *Hanging Out Your “Surveying Shingle”***
This session will deal with some ‘do’s and don’ts’ of starting a business. It will address financing, business, banker relationships, client agreements and contracts, diversification (AIKA surveying a recession), corporate structure and insurance. The advantages to working your way up in or purchasing an existing business, existing relationships and how to maintain them.
Panelists: Ray Riggs, PLS, Riggs Brothers Surveying; Ralph Riggs, PLS, Riggs Brothers Surveying; Troy Hayes, PLS, Midland Surveying; Dan Govero, PLS, Govero Land Services
- 10:00 – 10:30 am BREAK with EXHIBITORS
- 10:30 – 12 noon **PANEL DISCUSSION: *Survey Necessities***
We have been told you get one chance at making a first impression. When we arrive to prepare a survey of any kind what impression does our firm create and is that important? The reason why first impressions are so important is that they last well beyond the moment. This is thanks to something called the primacy effect, which means that when someone experiences something before other things in a sequence, they remember that first thing more vividly than anything else. Let’s share with each other how, as a profession, surveyors can make better first impressions. Is that done with the different types of tools we have available that did not exist some number of years ago? Do we organize our vehicles so we can locate tools and material efficiently? Are we using the most cost-effective tool for the job? Share photos of how you have organize your workspaces and the tools you use as mentioned in the December, 2022 issue of Missouri Surveyor on page 18 and we will add them to this presentation.
Panelists: Kellan Gregory, PLS, Lamp Rynearson; Norm Ellerbrock, PLS, Four Points Survey; Mike Zahner, PLS, Zahner, Inc.; Mark Wiley, PLS, SWT Design
- 12:00 – 1:00 pm LUNCH with EXHIBITORS (included with registration)
- 1:00 – 2:30 pm ***Suggestions on How to Manage Your Business and Sales During a Recession***
This course will help you understand a recession and how to prepare to ride out the storm while still making sales. It will cover everything from understanding the economics of a recession and give you tools to continue making sales while protecting your profit margins. Of course, this is not as easy as it sounds, but you will have the tools to control the outcome.
Speaker: Robert Bailey, Robert Bailey Sales Consultant
- 2:30 – 3:00 pm BREAK with EXHIBITORS
- 3:00 – 5:15 pm ***Suggestions on How to Manage Your Business and Sales During a Recession*** continued
- 5:30 pm RECEPTION WITH EXHIBITORS
(complimentary beer, wine and hors d’oeuvres—included with registration)

Saturday, April 29, 2023

- 7:00 am REGISTRATION OPENS
- 7:00 – 8:00 am BREAKFAST BUFFET (included with registration)
- 8:00 – 10:00 am **PANEL DISCUSSION: *Systems Overview***
Panelists: Ladd Nelson, Carlson Software; Pat Stack, Seiler Geospatial; Sean Cleveland, Seiler Geospatial; Zephaniah Smith, Topcon Solutions; Brett Black, LEICA; Terri Rollings, Transit & Level; Charles (Bucky) Lawley, Transit & Level
- 10:00 – 10:30 am BREAK with EXHIBITORS
- 10:30 – 12 noon **BREAKOUT SESSIONS: Individual Detail of Programs**
Leveraging the Power of Windows During Field Data Collection to Help Maintain Data Security and Integrity
Speaker: Ladd Nelson, Director-Midwest Sales, Carlson Software
- Common Mistakes Made in the Field by Survey Parties***
Pat Stack, Seiler Geospatial; Sean Cleveland, Seiler Geospatial
- Magnet Solutions***
Zephaniah Smith, Senior Support Specialist, Topcon Solutions
- New Product Overview: Leica Robotic Auto Pole System, Leica Ground Penetrating Radar, BLK Scanning Applications, Hydrographic Surveying with the Apache***
Terri Rollings, Transit & Level; Charles (Bucky) Lawley, Transit & Level, Brett Black, LEICA
- 12:00 – 1:00 pm LUNCH (included with registration)
- 1:00 – 3:00 pm ***Everything You Need to Know About Easements***
An easement constitutes a right to use the property of another for a particular purpose. To have optimum utility and value, the real estate of your client must be connected to local infrastructure. To great measure, the value of land is measured in terms of the easements that benefit your client's tract and which burden the adjoiner's tract. The creation, interpretation, enforcement and termination of easement rights will be covered. A checklist will be provided that will guide the Surveyor through preparation of the terms and conditions of easement for a plat and for a conveyancing instrument that will both benefit and protect your client.
Speaker: Eric "Ric" C. Harris, J.D., Harris & Harris, P.C.
- 3:00 – 3:15 pm BREAK
- 3:15 – 5:15 pm ***Everything You Need to Know About Easements*** continued

Registration

Name _____ RLS # _____

Firm _____

Address _____

City, State _____ Zip _____

Phone _____ Email _____

REGISTRATION INFORMATION

The registration fee is \$275 for MSPS Members or \$425 for Non-Members. A rate of \$175 is available for non-licensed technicians (MSPS Associate Members), registration fee plus 2023 Associate Membership is \$210. The **deadline for registration is April 13, 2023**. After this date, a 10% processing fee will be added to all registrations. The registration fee includes instructional materials, refreshment breaks, lunch on both days, cocktail reception with exhibitors and two breakfasts for registered attendees only. Complete the registration form and mail form and payment to MSPS, 722 E. Capitol Avenue, Jefferson City, MO 65101.

LOCATION & LODGING

The Lodge of Four Seasons, 315 Four Seasons Drive, Lake Ozark is the location for the 2023 Spring Workshop. A block of rooms has been reserved in the main lodge at a rate of **\$134.00** for single or double occupancy. The **deadline for hotel reservations is April 5, 2023**. Make your reservation by calling the hotel at 888-265-5500.

GOLF TOURNAMENT

The MSPS PAC Fundraiser Golf Tournament will be held on Thursday, **April 27, 2023** at 1:00 pm at The Cove Golf Course and is \$85 per person. Two mulligans per person are included and prizes are given for first, second and third placed teams, along with prizes for long drive, closest to the pin and longest putt!

CONTINUING EDUCATION

This course has been approved for 15 PDUs (7.5 each day) with the Missouri Board for Architects, Professional Engineers, Professional Land Surveyors and Landscape Architects.

CANCELLATION POLICY

MSPS reserves the right to cancel the program and return all fees in the event of insufficient registrations. A participant may cancel a registration up to two weeks before the course date and receive a refund. A \$25 processing fee will be applied to all refunds. **NO REFUNDS will be made AFTER April 13, 2023.**

REGISTRATION FEES

(No Half Day Options)

MSPS Member - \$275

Friday Only (\$140)

Saturday Only (\$140)

Non-Member - \$425

Friday Only (\$215)

Saturday Only (\$215)

Technician - \$175

(Associate Member Rate Only)

Golf - \$85 per person

PAYMENT OPTIONS

Credit Card (Visa, MasterCard, Discover, American Express)

Check

Invoice my Firm

Credit Card # _____ Exp. Date _____

CVV Code _____ Amount Enclosed \$ _____

MSPS, 722 E. Capitol Avenue, Jefferson City, MO 65101

573-635-9446 ~ Fax: 573-635-7823 ~ mmps@missourisurveyor.org ~ www.missourisurveyor.org

Online Registration: <http://mmpsevents.com>

Return registration form and payment to MSPS before April 13, 2023.

New Year's Eve 2023 Marked the Retirement of the U.S. Survey Foot *(continued)*

U.S. Survey Foot: Revised Unit Conversion Factors

Approximate decimal SI equivalents for measures commonly given in U.S. survey feet and exact equivalents for the foot that will be adopted beginning January 1, 2023 and published in [NIST Handbook 44](#) (Appendix C, General Tables of Units of Measurements) and will be published in [NIST Special Publication 811](#), The NIST Guide for the use of the International System of Units.

Units based on the foot	Unit type	Exact U.S. customary definitions based on the foot, plus other exact definitions	International foot metric equivalent (<i>exact</i>)	U.S. survey foot metric equivalent (<i>approximate</i>)
foot (ft)	length	<i>Defined with respect to meter</i>	0.3048 m	0.304 800 609 601 m
cable's length	length	720 ft = 120 fathoms	219.456 m	219.456 438 913 m
chain (ch)	length	66 ft = 4 rd = 100 li	20.1168 m	20.116 840 234 m
fathom	length	6 ft	1.8288 m	1.828 803 658 m
furlong (fur)	length	660 ft = 10 ch = 40 rd	201.168 m	201.168 402 337 m
league	length	15,840 ft = 3 mi	4828.032 m	4828.041 656 083 m
link (li)	length	0.66 ft = 0.01 ch	0.201 168 m	0.201 168 402 m
mile (mi) ^(a)	length	5280 ft = 8 fur = 80 ch = 320 rd	1609.344 m	1609.347 218 694 m
rod (rd), pole, perch	length	16.5 ft = 0.25 ch	5.0292 m	5.029 210 058 m
square rod (rd ²), square perch, square pole	area	272.25 ft ² = 0.0625 ch ²	25.292 852 64 m ²	25.292 953 812 m ²
acre (ac)	area	43,560 ft ² = 10 ch ² = 160 rd ²	4046.856 422 4 m ²	4046.872 609 874 m ²
square mile (mi ²)	area	27,878,400 ft ² = 640 ac	2 589 988.110 336 m ²	2 589 998.470 319 521 m ²
acre-foot	volume	43,560 ft ³	1233.481 837 547 52 m ³	1233.489 238 468 149 m ³

defined using either definition of the foot, as is the case for all other units listed in this table. However, use of definitions based on the U.S. survey foot should be avoided after December 31, 2022 except for historic and legacy applications. 🇺🇸

Published by the *National Institute of Standards and Technology*, US Dept of Commerce:
<https://www.nist.gov/news-events/news/2023/01/new-years-eve-2023-marked-retirement-us-survey-foot>.

The Case for Responsible Professional Licensing

Overly broad “reform” jeopardizes the public and disadvantages hardworking professionals. There is a better path toward balanced, rational and methodical licensing.

by Illinois State Representatives Amy Elik and Natalie Manley, July 7, 2022



Illinois' laws do not diminish rigorous qualifications for highly complex, technical professions such as certified public accounting, engineering and architecture. (Shutterstock)

Let's start by saying the quiet part out loud: There are differences between us. We represent different political parties in the Illinois House of Representatives. We live in different parts of our state. But in these polarized times, we think it is important to look deeper and notice our similarities.

As legislators, we both seek to create new opportunities for hard-working families and help the Land of Lincoln get ahead. And as two certified public accountants, we know our profession plays a vital role in upholding the integrity of our country's financial system. This is why we both believe that rigorous licensing for professions with high public impact like ours is critical to the public's physical and financial well-being.

Across the country, lawmakers are looking for ways to boost state economies and ease the pressures of inflation. Overly broad licensing “reform” has emerged as a popular proposal, with special-interest groups casting it as a silver bullet to solve statewide workforce and economic development challenges. These bills aim to weaken, and sometimes outright eliminate, licensing requirements across state lines. Some of these lowlights would make it possible for almost anyone to enter into a state practice, regardless of whether they meet minimum professional qualifications. Other proposals relating to licensing include so-called “consumer beware” bills that would leave costly litigation and bad customer reviews as the only options for redress after harm has occurred.

These misguided proposals jeopardize the public and disadvantage hardworking professionals, especially those who have served the public well for decades and whose qualifications will be effectively nullified if passed into law. There is a much better way to approach licensing reform.

Through our work in the Illinois General Assembly, we have played a role in crafting and passing licensing reform. Licensure is complex, and if led down the wrong path, even well-intended elected officials can cause more harm than good. Poorly conceived licensing bills threaten existing systems that work and serve the public and the business community well.

The truth is that many licensure models already address the most common concerns around licensure, including mobility, minimum qualifications, examination and military spousal relocation.

Like other states, Illinois has embarked on a heightened review of occupational and professional licensing. As is often the case with complex legislation, the devil lives in the details — or lack thereof.

Unlike some proposals under consideration in our region of the country, Illinois' laws do not diminish rigorous qualifications for highly complex, technical professions such as certified public accounting, engineering, architecture, surveying and landscape architecture.

In one extreme case, another state's proposed law would have eliminated the ability to change examination requirements to reflect changes in codes, standards and the evolution of the profession. Other proposals would damage existing models that have served residents of those states well.

Fortunately, Illinois chose a different route. Our laws carefully identified and lowered barriers in licensing systems for specific occupations that could either prevent or make it difficult for re-entry and low-wage workers.

In 2021, for example, we both voted in favor of H.B. 5576, a "sunset review" bill enacted to require Illinois to collect data on all licensed professions and occupations and determine whether those requirements should be modified. It should be viewed as a framework for the nation on how state policymakers can eschew burdensome legislation to introduce balanced, rational and methodical approaches to reform the regulatory process.

Bills such as H.B. 5576 do not diminish the need for occupational and professional licensing, but they do relay a clear statement that a broad-brush, one-size-fits-all approach to reform is not in the best interest of the public or licensed professionals.

Unfortunately, we must acknowledge the trend of other states that are heading down the wrong path and avoiding common-sense solutions. We caution lawmakers to not rush down a path, paved by hardliners whose flawed proposals create new problems for constituents and do not take into account the public perception of licensure as necessary and beneficial. Public opinion data shows us that voters, regardless of gender, race, income or job role, recognize the value of uniform licensing requirements for professions like ours with high public impact.

Constituents are best served through smart policy that leads to meaningful improvements in licensing systems that benefit licensed professionals and the public we all serve. Despite our differences, we are united to convey how important it is for lawmakers to get licensing reform right and look toward proven models that have served the public well. 🇺🇸

Reprinted with permission from *Governing* (Nick Maggio); available as originally published at:
<https://www.governing.com/now/the-case-for-responsible-professional-licensing>



National Geodetic Survey

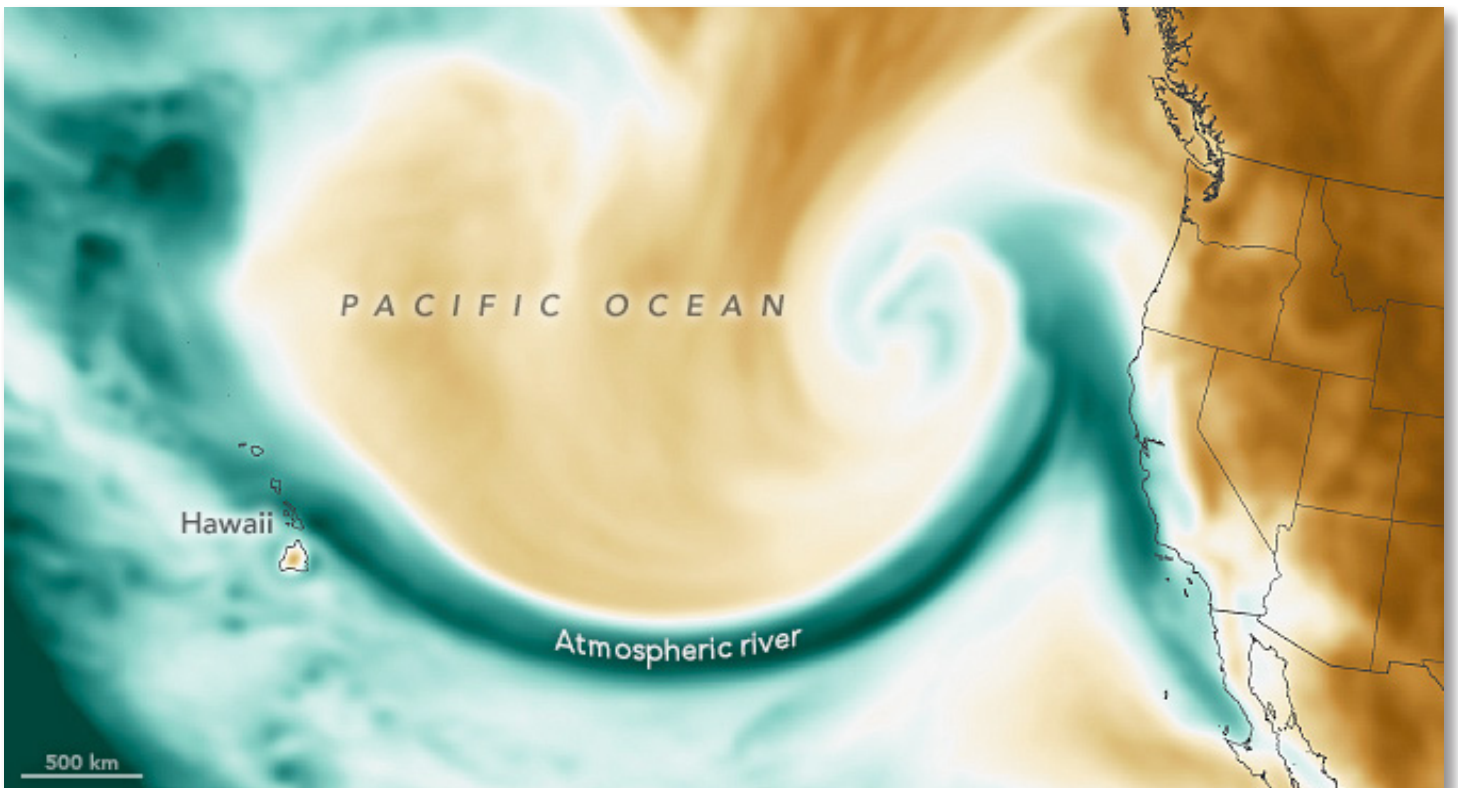
Positioning America for the Future

NGS Collects Images of Areas Impacted by Atmospheric Rivers

February 10, 2023

As part of NGS's mission to increase navigation safety and assess the impacts of major weather events on the shoreline, NGS collected imagery of California and Oregon coastal areas affected by recurring atmospheric river events. Atmospheric rivers are long, concentrated regions in the atmosphere that transport moist air from the tropics to higher latitudes. The moist air, combined with high wind speeds, produces heavy rain and snow upon landfall, especially over mountainous terrain. These extreme precipitation events can lead to flash flooding, mudslides, and catastrophic damage to life and property. This imagery, which is freely available to the public, can be incorporated into geographic information systems and can serve as a **reference to assess damage following other events**, such as hurricanes. See the imagery at:

https://geodesy.noaa.gov/storm_archive/coastal/viewer/index.html



From NASA Earth Observatory

NGS Briefs Census Bureau on Reference System Modernization

February 3, 2023

Two senior NGS staff members briefed U.S. Census Bureau leadership on the effects of the impending **National Spatial Reference System** modernization. Geography is central to the Census Bureau’s work as it provides the framework for survey design, sample selection, data collection, tabulation, and dissemination as well as meaning and context to statistical data. It is crucial that members of the Census Bureau understand the ramifications of implementing the new National Spatial Reference System since **coordinates will change**. A shift in the geospatial coordinates impacts all census data. Therefore, data must be carefully migrated after the modernization occurs. Speaking with Census Bureau leadership is critical to ensure that the transition to the modernized National Spatial Reference System can occur as seamlessly as possible.



NGS Participates in Deflection Measurement System Comparison

January 27, 2023

NGS staff from the **Testing and Training Center** and the Geosciences Research Division participated in a side-by-side comparison of state-of-the-art astronomical deflection of the vertical measurement systems. These deflection of the vertical systems use the stars to measure the shift or deflection in the direction of gravity given local geographical anomalies, such as mountains. The event was sponsored by the National Geospatial-Intelligence Agency and was held at the University of Texas at Austin. Multiple organizations’ instruments were tested during the event which allowed for verification of each system’s measurement precision and promoted technical collaboration regarding deflection of the vertical measurement systems advancement.

NGS Participates in Transportation Research Board Meeting

January 20, 2023

NGS participated in the 2023 Transportation Research Board Annual Meeting in Washington, D.C., as part of the Geospatial Control Subcommittee. The focus of the session was to better understand Transportation Research Board members’ concerns regarding the implementation of the modernized **National Spatial Reference System**. The discussions highlighted the importance of engaging with state departments of transportation to help them understand the



ramifications of implementing the new National Spatial Reference System since **coordinates will change**. The group also discussed how to better incorporate high-precision geospatial data into Geographic Information Systems and Building Information Modeling systems.

(continued on next page)

Secretary of Transportation Pete Buttigieg and Secretary of Energy Jennifer Granholm conducting a “fireside chat” at the 2023 Transportation Research Board Annual Meeting.

NGS News & Events *(continued)*

NGS Releases Updated Positioning Software

January 13, 2023

NGS released an updated version of the **Horizontal Time-Dependent Positioning** software application, which allows users to transform positional coordinates across time and between spatial reference frames. This functionality is critically important for high-accuracy geospatial applications. The updated application includes transformations of multiple reference systems, including the International Terrestrial Reference Frame 2020. Transformations involving earlier versions of the World Geodetic System 1984 spatial reference frame were also updated in this new version. The Horizontal Time-Dependent Positioning **user guide** was revised to reflect these updates and include reference frame and transformation definitions used by other geodetic databases. The Horizontal Time-Dependent Positioning software is available on NGS's website as well as on **GitHub**.

HTDP – Horizontal Time-Dependent Positioning

HTDP is a utility for transforming positional coordinates across time and between spatial reference frames. Go to:
<https://geodesy.noaa.gov/TOOLS/Htdp/Htdp.shtml>

HTDP User Guide available at:

<https://geodesy.noaa.gov/TOOLS/Htdp/HTDP-user-guide.pdf>

Also found on **GitHub** at:

<https://github.com/noaa-ngs/HTDP>

U.S. and Canada Host Geospatial Software Developers Summit

December 19, 2022

NGS and the **Canadian Geodetic Survey** hosted a binational geospatial software developers summit on the implementation of the modernized National Spatial Reference System. To transition to using the **modernized National Spatial Reference** system, surveyors and other geospatial professionals will need to change their current workflows. Therefore, NGS is proactively engaging surveying and mapping equipment manufacturers and geospatial software developers to ensure that our mutual customers experience a smooth transition.

Representatives from 13 private sector geospatial companies participated in more than seven hours of presentations and discussions during the two-day summit. Market-leading companies as well as open-source community representatives shared progress updates regarding implementing new file formats and provided NGS and the Canadian Geodetic Survey with valuable feedback.



NGS Participates in International Geodesy Meetings

December 12, 2022

NGS staff participated in the ninth session meeting of the **Global Geospatial Information Management: Americas** committee in Santiago, Chile. The Global Geospatial Information Management: Americas is a regional committee of the United Nations that is in charge of implementing and coordinating geospatial management for the region. An NGS regional geodetic advisor represented the United States in the meeting and the NGS Chief Geodesist presented an update regarding the United Nations Subcommittee on geodesy's global activities. While in Chile, NGS scientists also participated in two side events that focused on building regional spatial data infrastructure. NGS's participation in these events aided regional coordination of geospatial activities and highlighted their leadership within NOAA and the United States government.



New Global Reference Frames Released

November 18, 2022



In October, the international Earth Rotation and Reference System Service — the body responsible for maintaining reference frame standards — released a new global reference system, the **International Terrestrial Reference Frame 2020**. The International Global Navigation Satellite System Service also recently released a **new reference frame**. These transitions will change some of the fundamental products used in GPS and global navigation satellite system data processing. This and other reference system updates should have no impact on users of **NGS's Online Positioning User Service (OPUS)**, however. The GPS data processing methods used by OPUS will mitigate changes in data processing and file name conventions without affecting user experience.

ITRF2020, the new realization of the **International Terrestrial Reference System** –
<https://itrf.ign.fr/en/solutions/ITRF2020>

The **International Global Navigation Satellite System Service** reference frame –
<https://igs.org/wg/reference-frame/>

(continued on page 41)

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Vice President



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Cell 573-883-6259

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GERALD BADER
Missouri P.L.S.

16255 Sugar Bottom Rd. Ste. Genevieve, MO 63670

Thoughts on Professional Practice and Education

by Knud E. Hermansen† P.L.S., P.E., Ph.D., Esq.

Article 9: Multiple Discipline Licenses and Certifications

This is the ninth article I have prepared in the series offering thoughts on professional practice and education. In this article, I discuss multiple discipline licenses and certifications. Contrary to many of my other articles, I doubt there are opposing sides that wish to argue or advocate for or against what I write. Though I suppose there will always be one or two readers that may wish to dispute what I have written.

I use the term ‘license’ and the term ‘certificate’ to indicate separate and distinct achievements. As I will use these terms in this article, a license is an authorization to practice that is governed by a separate government board. Various state laws require a person have this authorization in order to provide some defined service to the public.

A certificate, on the other hand, is generally an accomplishment used to indicate some special knowledge, achievement, or skill set of the certificate holder. Many certifications are controlled by private or government organizations that have taken it upon themselves to exert knowledge or skilled based dominion over some special body of knowledge or skill. The necessity of having the certificate to provide a service is usually governed by private contract, local law, or agency regulation rather than state statute or mandatory regulation.

What I mean by multiple licenses or certifications is that the licensed surveyor is also licensed or certified in some other profession, specialty, practice, or trade. For example, in addition to my surveying license, I also hold licenses as a professional engineer and attorney at law.

I don’t think multiple discipline licenses or certificates are always necessary. I do think other professional licenses and certifications can be helpful and profitable especially if connected to land surveying services. I would estimate that half the licensed surveyors that have practiced for ten or more years hold other professional licenses or certificates along with their survey license. I think a vast majority find their licenses and certificates useful and profitable. After all, if not useful or profitable, licenses and certificates can be dropped or relinquished.



Some of the most common licenses that are held by land surveyors in conjunction with their survey license include: professional engineer, forester, landscape architect, attorney, realtor, and septic system designer.

Certifications are more numerous and widespread among surveyors. Certifications that are popular among licensed surveyors include: photogrammetrist, wetlands specialist, notary, OSHA, federal surveyor, project manager, floodplain manager, drone operator, and hydrographer, to name a few. The term ‘certification’ is often attached to the name of the specialty, the entirety abbreviated, and placed after the surveyor license such as a certified floodplain manager (CFM) or certified federal surveyor (CFedS).

Additional licenses are not easy to obtain and often require extra college courses, additional degrees, experience, and testing. Though there are exceptions to this statement such as the licensed real estate agent (realtor). I am unaware of any state that offers a realtor degree though I would not be surprised to be informed of some university program that does offer such a degree. Thirty years in college teaching has shown a degree is easily initiated at an institution based on the attraction of the degree name among the inexperienced youth rather than the needs of society or demands of the society.

I am not going to discuss how to obtain two or more licenses in detail since state law often governs the ease or difficulty of such endeavors. I believe two or more licenses is best obtained while young with grand plans or while old and unfulfilled dreams (bucket list), or frustrated with just one license. I make this statement because the work and effort required for the second license is not

always commiserate with employment, family, and other commitments that the typical life of a middle age married adult with children will allow.

I should note that often one license can be obtained with just an undergraduate degree in surveying and a second license obtained with a graduate school degree in another field. Such is the case when obtaining a law degree.

Certificates are easier to obtain as they seldom require a specific degree, though wetlands specialist is often an exception requiring a degree focused on soil science, biology, or botany. Most certificates are gained by experience and testing or in a few cases, just testing. Information for obtaining certifications is readily available on the internet. Experience has shown that many certifications are gained by happenstances where services are performed in the area leading the practitioner to conclude the next step toward certification is easily taken or they wish to focus on providing certain services where a certification makes it more likely they will be contracted for the services.

I would encourage surveyors to seek licenses or certifications in fields or services they enjoy or wish to pursue. I would encourage young people about to embark on the path to a surveying career to examine their options and to make the most of their college experience. I suspect I am not the only person that wishes they had deviated somewhat in youthful pursuits to make the most of a professional career. 🇺🇸

† Other books and articles by Knud can be found at <https://umaine.edu/svt/faculty/hermansen-articles/>

OnDemand Topo Maps Officially Join USGS National Map Offerings

by *Communications and Publishing (USGS), January 23, 2023*

The people have spoken! *OnDemand* Topo maps and *topoBuilder* were so popular that we're ending the pilot phase of the project and making *topoBuilder* a permanent offering of the National Map.

In February 2022, the National Geospatial Program launched *topoBuilder*, a customer driven, on-demand, topographic mapping capability. Starting January 23, 2023, *topoBuilder* and *OnDemand* topo maps will cease their pilot project phase and join US Topo as a standard offering from the NGP. With *topoBuilder*, users can center maps wherever they choose within the U.S. and territories. *OnDemand* Topo map extents do not need to align with the traditional grids used by other USGS topographic maps, so one map can cover an area that would previously require up to four maps.

Users can choose georeferenced PDF or TIFF as well as the level of contour detail to best suit their needs. *OnDemand* Topo contours are generated on the fly from the latest USGS elevation data, acquired through the 3D Elevation Program. The topographic map remains an indispensable tool for everyday use in many fields. Be a part of the future of the USGS topographic mapping and visit topobuilder.nationalmap.gov to build your customized *OnDemand* Topo!



Revised Statutes of Missouri; Changes for Surveying and Surveyors

from Revisor of Missouri, February 15, 2023

The past year was an active era for changes to statutes pertaining to surveying and surveyors in Missouri. During the 2022 1st Extraordinary Session of the Missouri Legislature, HB 3 included provisions to *Chapter 60 County Surveyors and Land Surveys*. Achieved through the diligent sponsorship of fellow surveyor and Representative Don Mayhew of Crocker, the changes made are specific to RSMo. 60.301, 60.315 and 60.345. Effective as of January 2, 2023, those chapters are reprinted herein with new language in **bold text**.

During the 2022 General Session, being Missouri's 101st General Assembly, HB 2149 was passed with provisions making changes to *Chapter 327 Architects, Engineers, Land Surveyors and Landscape Architects*. After multiple years of attempts sponsored by MSPS, legislation enhancing the requirements for those entering into the process of obtaining a surveying license made changes to RSMo. 327.312, 327.313, 327.314 and 327.331. Effective as of August 28, 2022, those chapters are reprinted herein with new language in **bold text**.

60.301. Definitions. — Whenever the following words and terms are used in this chapter they shall have the following meaning unless the context clearly indicates that a different meaning is intended:

(1) “Corners of the United States public land survey”, those points that determine the boundaries of the various subdivisions represented on the official plat such as the township corner, the section corner, the quarter-section corner, grant corner, meander corner, **and center of section**;

(2) “Existent corner”, a corner whose position can be identified by verifying the evidence of the original monument or its accessories, or by some physical evidence described in the field notes, or located by an acceptable supplemental survey record or some physical evidence thereof, or by testimony. The physical evidence of a corner may have been entirely obliterated but the corner will be considered existent if its position can be recovered through the testimony of one or more witnesses who have a dependable knowledge of the original location. A legally reestablished corner shall have the same status as an existent corner;

(3) “Lost corner”, a corner whose position cannot be determined, beyond reasonable doubt, either from traces of the original marks or from acceptable evidence or testimony that bears upon the original position;

(4) “Monument”, the physical object which marks the corner point determined by the surveying process. The accessories, such as bearing trees, bearing objects, reference monuments, mounds of stone and other similar objects that aid in identifying the corner position, are also considered a part of a corner monument;

(5) “Obliterated, decayed or destroyed corner”, a **position** at whose point there are no remaining traces of the original monument or its accessories, but whose location has been perpetuated by subsequent surveys, or the point may be recovered beyond reasonable doubt by the acts and testimony of local residents, competent surveyors, other qualified local authorities or witnesses, or by some acceptable record evidence. A position that depends upon the use of collateral evidence can be accepted only if duly supported, generally through proper relation to known corners, and agreement with the field notes regarding distances to natural objects, stream crossings, line trees, etc., or unquestionable testimony;

(6) “Original government survey”, that survey executed under the authority of the United States government as recorded on the official plats and field notes of the United States public land survey maintained by the Missouri department of agriculture;

(7) “Proportionate measurement”, a measurement of a line that gives equal relative weight to all parts of the line. The excess or deficiency between two existent corners is so distributed that the amount of excess or deficiency given to each interval bears the same proportion to the whole difference as the record length of the interval bears to the whole record distance:

(a) “Single proportionate measurement”, a measurement of a line applied to a new measurement made between known points on a line to determine one or more positions on that line;

(b) “Double proportionate measurement”, a measurement applied to a new measurement made between four known corners, two each on intersecting meridional and latitudinal lines, for the purpose of relating the intersection to both. When the total length of the line between the nearest existing corners was not measured in the original government survey, the record distance from one existing corner to the lost corner will be used instead of the proportionate distance. This exception will apply to either or both of the east-west or north-south lines;

(8) “Record distance”, the distance or length as shown on the original government survey. In determining record distances, consideration shall be given as to whether the distance was measured on a random or true line.

(L. 1989 H.B. 190, et al., A.L. 2013 H.B. 28 merged with H.B. 650, A.L. 2022 1st Ex. Sess. H.B. 3)

60.315. Lost corners reestablishment — rules. — The following rules for the reestablishment of lost corners shall be applied only when it is determined that the corner is lost: (The rules utilize proportional measurement which harmonizes surveying practice with legal and equitable considerations. This plan of relocating a lost corner is always employed unless it can be shown that the corner so located is in substantial disagreement with the general scheme of the original government survey as monumented. In such cases the surveyor shall use procedures that produce results consistent with the original survey of that township.)

(1) Existent original corners shall not be disturbed. Consequently, discrepancies between the new and record measurements shall not in any manner affect the measurements beyond the existent corners; but the differences shall be distributed proportionately within the several intervals along the line between the corners;

(2) Standard parallels shall be given precedence over other township exteriors, and, ordinarily, the latter shall be given precedence over subdivisional lines; section corners shall be located or reestablished before the position of lost quarter-section corners can be determined;

(3) Lost township corners common to four townships shall be reestablished by double proportionate measurement between the nearest existent corners on opposite sides of the lost township corner;

(4) Lost township corners located on standard parallels and common only to two townships shall be reestablished by single proportionate measurement between the nearest existent corners on opposite sides of the lost township corner on the standard parallel;

(5) Lost corners on township exteriors, excluding corners referenced in subdivision (3) of this section, whether they are standard or closing corners, shall be reestablished by single proportionate measurement on the line connecting the next nearest existent standard or closing corner on opposite sides of the lost corner;

(6) A lost interior corner of four sections shall be reestablished by double proportionate measurement;

(7) All lost quarter-section corners on the section boundaries within the township shall be reestablished by single proportionate measurement between the adjoining section corners, after the section corners have been identified or reestablished; and

(8) Where a line has been terminated with a measurement in one direction only, a lost corner shall be reestablished by record bearing and distance, counting from the nearest regular corner, the latter having been duly identified or reestablished.

(continued on next page)

Revised Statues of Missouri; Changes for Surveying and Surveyors *(continued)*

(L. 1989 H.B. 190, et al., A.L. 1999 H.B. 776, **A.L. 2022 1st Ex. Sess. H.B. 3**)

60.345. Corners of quarter-sections south of township line, east of range line, how established. — The quarter-section corners of sections south of the township line and east of the range line, and not established by the original government survey will be established according to the conditions represented upon the official government plat using **single** proportionate measurement between the section corners belonging to the same section as the quarter-section corner being established, the section corners having first been identified or reestablished. **The proportional position shall be offset, if necessary, in a cardinal direction to the true line defined by the nearest adjacent corners on opposite sides of the quarter-section corner to be established.**

(L. 1989 H.B. 190, et al., **A.L. 2022 1st Ex. Sess. H.B. 3**)

327.312. Land surveyor-in-training applicant for enrollment, qualifications — certificate issued when — surveyor-intern enrollment, when. — 1. **Prior to January 1, 2024**, any person may apply to the board for enrollment as a land surveyor-in-training who is a high school graduate, or who holds a Missouri certificate of high school equivalence (GED), and either:

(1) Has graduated and received a baccalaureate degree in an approved curriculum as defined by board regulation which shall include at least twelve semester hours of approved surveying course work as defined by board regulation of which at least two semester hours shall be in the legal aspects of boundary surveying; or

(2) Has passed at least sixty hours of college credit which shall include credit for at least twenty semester hours of approved surveying course work as defined by board regulation of which at least two semester hours shall be in legal aspects of boundary surveying and present evidence satisfactory to the board that in addition thereto such person has at least one year of combined

professional office and field experience in land surveying projects under the immediate personal supervision of a professional land surveyor; or

(3) Has passed at least twelve semester hours of approved surveying course work as defined by board regulation of which at least two semester hours shall be in legal aspects of land surveying and in addition thereto has at least two years of combined professional office and field experience in land surveying projects under the immediate personal supervision of a professional land surveyor. Pursuant to this provision, not more than one year of satisfactory postsecondary education work shall count as equivalent years of satisfactory land surveying work as aforementioned.

2. The board shall issue a certificate of completion to each applicant who satisfies the requirements of the aforementioned land surveyor-in-training program and passes such examination or examinations as shall be required by the board.

3. Beginning January 1, 2024, any person may apply to the board for enrollment as a land surveyor-intern who is a high school graduate, or who holds a certificate of high school equivalence (GED), and has passed any examination required by the board pursuant to section 327.331.

(L. 1983 H.B. 319, A.L. 1999 H.B. 343, A.L. 2014 S.B. 809, A.L. 2018 H.B. 1719, A.L. 2020 H.B. 2046, **A.L. 2022 H.B. 2149**)

327.313. Surveyor-intern, application for enrollment, form, content, false affidavit, penalty, fee. — Applications for enrollment as a land **surveyor-intern** shall be typewritten on prescribed forms furnished to the applicant. The application shall contain applicant's statements showing the applicant's education, experience, and such other pertinent information as the board may require. Each application shall contain a

(continued on page 40)

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Revised Statues of Missouri; Changes for Surveying and Surveyors (continued)

statement that it is made under oath or affirmation and that the representations are true and correct to the best knowledge and belief of the applicant, subject to the penalties of making a false affidavit or declaration and shall be accompanied by the required fee.

(L. 1983 H.B. 319, A.L. 1999 H.B. 343, A.L. 2014 S.B. 809, A.L. 2018 H.B. 1719 merged with S.B. 843, **A.L. 2022 H.B. 2149**)

327.314. Professional land surveyor, applicant for license, qualifications. — 1. **Prior to January 1, 2024**, any person may apply to the board for licensure as a professional land surveyor who has been enrolled as a land surveyor-in-training and has presented evidence to the satisfaction of the board that said person has acquired at least four years of satisfactory professional field and office experience in land surveying from the date of enrollment as a land surveyor-in-training. This experience shall have been under the immediate personal supervision of a professional land surveyor.

2. **Beginning January 1, 2024**, any person may apply to the board for licensure who presents evidence satisfactory to the board that the applicant has met the requirements as provided in this subsection:

(1) **An applicant shall be a high school graduate or hold a certificate of high school equivalency (GED), and either:**

(a) **Has graduated and received a baccalaureate degree in an approved curriculum, as defined by the board, which shall include at least fifteen semester hours of approved surveying course work, as defined by the board, of which at least six semester hours shall be in the legal aspects of boundary surveying; or**

(b) **Has passed at least sixty hours of college credit which shall include at least fifteen semester hours of approved surveying course work, as defined by the**

board, of which at least six semester hours shall be in legal aspects of boundary surveying; or

(c) **Has passed at least fifteen semester hours of approved surveying coursework, as defined by the board, of which at least six semester hours shall be in legal aspects of land surveying;**

(d) **An applicant meeting the requirements of paragraph (a) of this subdivision shall have acquired at least four years of satisfactory field and office experience in land surveying under the immediate personal supervision of a professional land surveyor;**

(e) **An applicant meeting the requirements of paragraph (b) of this subdivision shall have acquired at least five years of satisfactory field and office experience in land surveying under the immediate personal supervision of a professional land surveyor;**

(f) **An applicant meeting the requirements of paragraph (c) of this subdivision shall have acquired at least six years of satisfactory field and office experience in land surveying under the immediate personal supervision of a professional land surveyor. Pursuant to this provision, up to one year of postsecondary education, approved by the board, may count as equivalent work experience;**

(2) **An applicant shall pass any examinations required by the board pursuant to section 327.331;**

(3) **Any person enrolled as a land surveyor-in-training prior to January 1, 2024, shall only be required to meet the requirements in place pursuant to their enrollment.**

(L. 1983 H.B. 319, A.L. 1999 H.B. 343, A.L. 2001 H.B. 567, A.L. 2014 S.B. 809, **A.L. 2022 H.B. 2149**)


327.331. Examinations, land surveyor-in-training, surveyor-intern, and land surveyors — content — grade

required to pass — effect. — 1. After it has been determined that an applicant possesses the qualifications entitling the applicant to be examined, each applicant for examination and enrollment as a land surveyor-in-training and for examination and licensure as a professional land surveyor in Missouri shall appear before the board or its representatives for examination at the time and place specified.

2. The examination or examinations shall be of such form, content and duration as shall be determined by the board to thoroughly test the qualifications of each applicant to become enrolled as a land **surveyor-intern** or to become licensed as a professional land surveyor in Missouri.

3. Any applicant to be eligible for enrollment or for license must make a grade on the applicable examination of at least seventy percent.

4. Any person who passes the examination hereinabove specified shall be entitled to be enrolled as a land **surveyor-intern** or licensed as a professional land surveyor, as the case may be, in Missouri and shall receive a certificate of enrollment or a license, as the case may be.


(L. 1969 S.B. 117, A.L. 1981 S.B. 16, A.L. 1983 H.B. 319, A.L. 1999 H.B. 343, A.L. 2014 S.B. 809, **A.L. 2022 H.B. 2149**) 

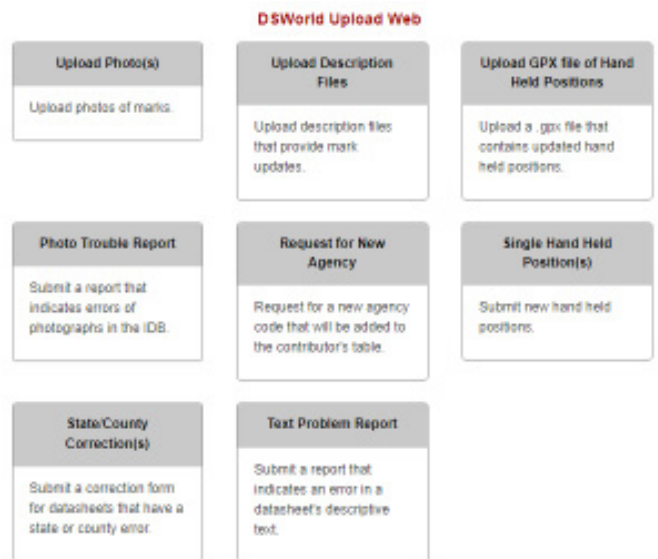
<https://revisor.mo.gov/main/Home.aspx>

NGS News & Events *(continued)*

NGS Releases New DSWorld Online Tool

November 14, 2022

NGS released a new **DSWorld Upload Web Form** for geospatial professionals and the public. DSWorld software is a free NGS application that provides users with up-to-date geodetic control information at the click of a button. The DSWorld Upload Web Form offers many of the same features as the application, but it also allows survey mark users to upload new photos, description files, and locations for existing datasheets. This new tool enhances application functionality by allowing users to report any errors discovered within the database to photos, positions, or text. 



DSWorld Upload Web

- Upload Photo(s)
Upload photos of marks.
- Upload Description Files
Upload description files that provide mark updates.
- Upload GPX file of Hand Held Positions
Upload a .gpx file that contains updated hand held positions.
- Photo Trouble Report
Submit a report that indicates errors of photographs in the iDB.
- Request for New Agency
Request for a new agency code that will be added to the contributor's table.
- Single Hand Held Position(s)
Submit new hand held positions.
- State/County Correction(s)
Submit a correction form for datasheets that have a state or county error.
- Text Problem Report
Submit a report that indicates an error in a datasheet's descriptive text.

DSWorld Upload Web Form available at –
https://beta.ngs.noaa.gov/datasheets/dsworld_web/upload_forms/index.html

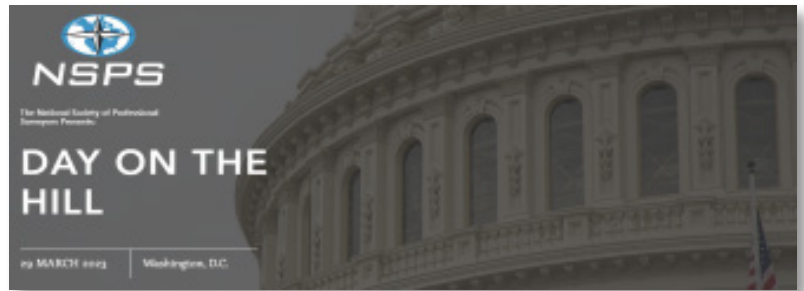


NEWS & VIEWS

National Society of Professional Surveyors

Register Now to Attend the NSPS Day on the Hill on March 29 *NSPS, February 9, 2023*

Make plans to attend the 2023 NSPS Day on the Hill scheduled for March 29, 2023. NSPS members will travel to Capitol Hill in Washington, DC to meet with members of the U.S. House of Representatives and Senate, and their staffs, to discuss (1) the need for improved broadband mapping and deployment of the related telecom infrastructure given the billions of Federal infrastructure dollars to be invested; (2) reauthorization and reform of the National Flood Insurance Program (NFIP) in the Federal Emergency Management Agency (FEMA), including the NSPS-backed legislation known as the IMAGES Act; and (3) recognition of the importance of professional licensing in surveying and other design professions to protect public health, safety, and welfare and distinguishing these disciplines from other occupational licenses that have been the subject of de-licensing efforts.



NSPS Officer Election Results *NSPS, January 12, 2023*



Davey Edwards – Texas



Linda Foster – South Dakota




Robert Miller - Pennsylvania


The member votes have been tallied and NSPS is pleased to announce that Davey Edwards and Linda Foster have been elected to serve as the President-Elect and Vice President, respectively, for the 2023/24 term. They will be sworn in as Officers at the Spring Business Meeting in March. Robert Miller, the NSPS incumbent Treasurer, was unopposed and will serve another two-year term. Please join us in congratulating them on their election and to also thank Steve Gould, Danny Martinez, and Matt Morris for their candidacies.

National Scout Jamboree - July 19-28, 2023

NSPS, February 2, 2023

NSPS is once again coordinating the Surveying Merit Badge program being held at its permanent location, The Summit Bechtel Reserve in West Virginia on July 19-28, 2023. While we have returning volunteers to help teach and promote surveying to the scout during the event, we are looking for more participants to add to the ranks of Jamboree attendees. For more information on the Jamboree and how NSPS is involved check out the following link – 

<https://www.nspss.us.com/page/BSMeritBadge>


NSPS

National Society of Professional Surveyors
5119 Pegasus Court, Suite Q, Frederick, MD 21704
Phone: 240-439-4615 | Fax: 240-439-4952 | [nspss.us.com](https://www.nspss.us.com)

To Whom It May Concern,

The Boy Scouts of America was founded in 1910, and since 1911 the Surveying Merit Badge has been offered to Scouters throughout the country. It is one of only a few that still exist from the original offering of 1911 merit badges. Over the years the requirements have changed and adapted to ever changing technology, but the principles and practices have been put forth to Scouters for them to learn and expand their experiences and knowledge. The Surveying Merit Badge has proven to be an effective way to get kids interested in Surveying, in fact, I was one of those kids. My name is Kyle Schultze, and when I was 17, I took the Surveying Merit Badge at a local college, and became interested in Surveying and its different applications. Before long I was studying Surveying at that same college, studying for my licensing exams, and now enjoying a career as a Land Surveyor. My experience is like many others that I have met over the years, but I need help in reaching future Land Surveyors.

The National Scout Jamboree is held every four years, now at its permanent location, The Summit Bechtel Reserve in West Virginia. The Jamboree is an event unlike any other in Scouting. Scouts come from all across the country, and even a few from around the globe, to participate. There are many fun and exciting events and things to do during the 10 day event. While at the Jamboree, Scouts can participate in white water rafting, zipline, rifle, mountain biking, concerts, conservation, and merit badges. The next Jamboree is going to be held July 19-28th, 2023. I am excited to be the Merit Badge Booth Coordinator for the Surveying Merit Badge for this years Jamboree.

This will be my sixth Jamboree since I started in Scouting, and my third teaching the Surveying Merit Badge. The National Society of Professional Surveyors has been supporting the Surveying Merit Badge at the Jamboree for even longer, and together we have begun to plan for this Jamboree. This is where we need your help. We need staff to teach, money for various expenses, and some donations for giveaway items like mugs, hats, or t-shirts. It is really surprising what kids will do for a freebie! Staffing is flexible with day, week, or the full 10 day options to suit various needs, and any donation goes a long way towards helping us have a great booth. For more information on how you can get involved, or help support the Surveying Merit Badge Booth, please reach out to me.

Thank you for your time and attention, and your support of the Surveying Merit Badge.

Sincerely,

Kyle Schultze, PLS Surveying Merit Badge Booth Coordinator 2023 National Scout Jamboree	David Collier, LS Scouting Committee Chair NSPS Director – New Hampshire
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(continued on page 47)

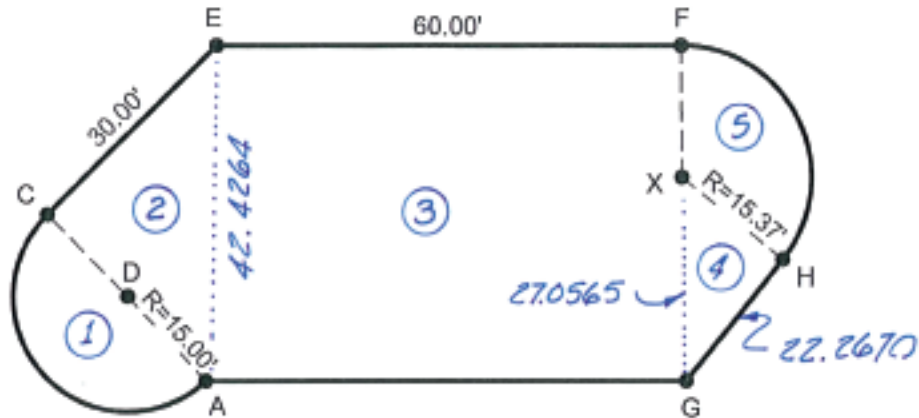
Geometry Solutions

by Elgin

Solution:

No. 1

Divide the figure into parts 1 through 5:



Semicircle 1:

$$\pi R^2 / 2, \text{ Area} = \dots\dots\dots 353.429$$

Triangle 2, a right Δ

$$(CA)(CE) / 2, \text{ Area} = \dots\dots\dots 450.000$$

Rectangle 3

$$\text{Area} = \dots\dots\dots 2545.584$$

Triangle 4, a right Δ

$$(GH)(HX) / 2, \text{ Area} = \dots\dots\dots 171.121$$

Sector 5

$$\text{Angle } HXF = 124^\circ 36' 56.6''$$

$$\pi R^2 (\angle HXF / 360^\circ), \text{ Area} = \dots\dots\dots \underline{\underline{256.902}}$$

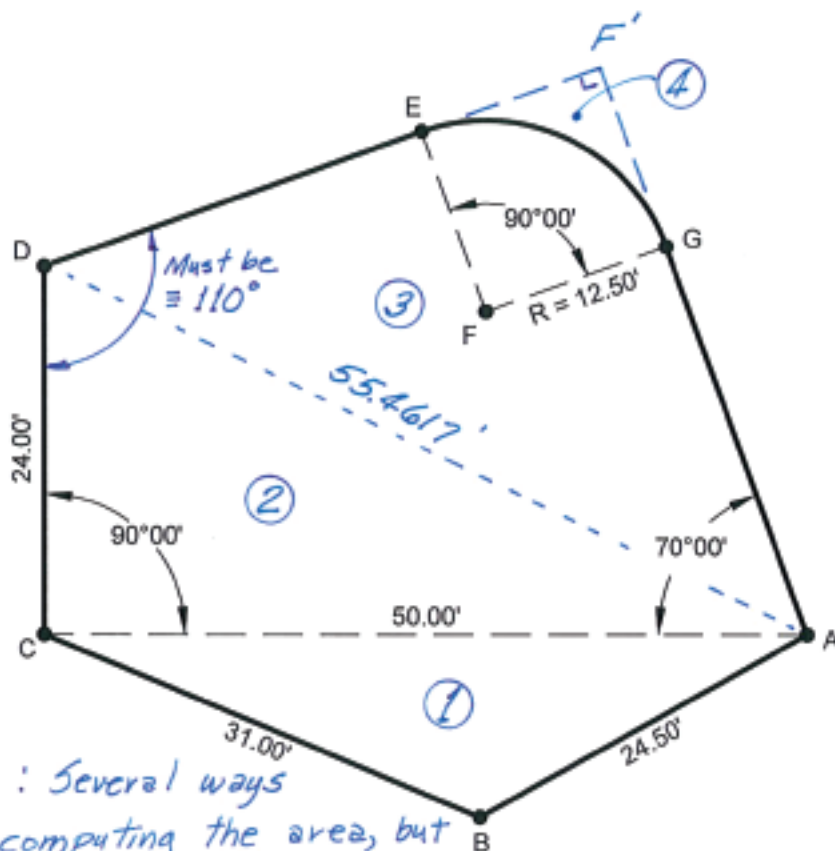
$$\underline{\underline{\text{Figure's Area} = 3777.04 \text{ ft}^2}}$$

Solution to geometry problem
posed by Dr. Richard Elgin, P.S.

Solution:

No. 2

First recognize $\angle F'DA \equiv 110^\circ$ ($\angle C F' \equiv 90^\circ$)
 Cut the figure into Δ 's 1, 2 and 3 and
 the fillet, 4.



$\Delta 1$: Several ways
 of computing the area, but

Area = 298.550

$\Delta 2$: Simple, Area = 600.000

$\Delta 3$ ($DF'E$): Several ways, Area = 768.810

The fillet, 4:

$R^2 - \frac{90}{360} \pi R^2$, Area = (-) 33.532

Solution to geometry problem
 posed by Dr. Richard Elgin, P.S.

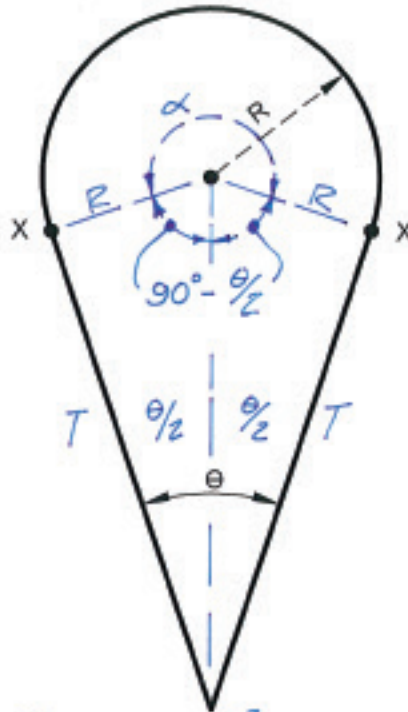
Figure's Area = 1633.83 ft²

(continued on next page)

Geometry Solutions (continued)

Solution and a check:

No. 3



So -
 $\alpha = 360^\circ - 2(90^\circ - \frac{\theta}{2})$

$$\alpha = 180^\circ + \theta$$

Total figure area =
 $RT - \frac{\alpha}{360^\circ} (\pi R^2)$

Substituting:

$$\text{Area} = R \left(\frac{R}{\tan \frac{\theta}{2}} \right) + \frac{\alpha \pi R^2}{360^\circ}$$

$$\text{Area} = R^2 \cotan \frac{\theta}{2} + \frac{(180^\circ + \theta) \pi R^2}{360^\circ}$$

$$\text{Area} = R^2 \cotan \frac{\theta}{2} + \frac{1}{360^\circ} (180^\circ \pi R^2 + \theta \pi R^2)$$

The Equation \rightarrow $\text{Area} = \cotan \frac{\theta}{2} R^2 + 1.570796327 R^2 + 0.00872665 \theta R^2$

The Test \rightarrow For $\theta \equiv 45^\circ$ and $R \equiv 100$ ft,

$\text{Area} = 43,777.09 \text{ ft}^2$

Solution to geometry problem
 posed by Dr. Richard Elgin, PS.

NSPS News & Views *(continued)*

Virginia Senate Panel Exempts Surveying from Licensing Reciprocity Bill *NSPS, January 26, 2023*

A state legislative bill that takes a broad brush to licensing by permitting anyone licensed in any occupation in another state to get a blanket comity or reciprocity to be licensed in Virginia was amended in a Virginia State Senate Committee last week to exempt land surveying and other professions, thanks to an amendment sought by the Virginia Association of Surveyors. SB1213 as introduced failed to take into account the impact on engineering and surveying and their effect on the public health, safety, and welfare. The exemption appears on line 50 of the bill. This is a big victory as VAS protects the integrity of the surveyors' license in the Commonwealth. The bill is consistent with a model bill, the Universal Recognition of Occupational Licenses Act, promoted by a coalition of organizations, which has been enacted in some form in 19 other states.



USGS 3DEP for Western Federal Lands Cited in Appropriations Document *NSPS, January 20, 2023*

The Congressional Research Service (CRS), an arm of the Library of Congress that provides analysis to lawmakers, issued a recent report that found for fiscal year 2023 the National Geospatial Program of the U.S. Geological Survey (USGS) increased by \$6.1 million, of which \$3 million was for the 3D Elevation Program (3DEP), a NSPS-supported program, with such funds targeted for high-resolution topographic elevation data on western federal lands. 🇺🇸

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