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July, 2026



LINES & POINTS

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PLSW (Professional Land Surveyors of Wyoming; PO Box 8, Cheyenne, WY 82003) is a statewide organization of Land Surveyors registered to practice in the Equality State of Wyoming. PLSW is dedicated to improving the technical, legal, and business aspects of surveying in the State of Wyoming. PLSW is affiliated with the National Society of Professional Surveyors (NSPS) and the Western Federation of Professional Land Surveyors (WestFed).

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On The Cover

STONE MONUMENT FOUND SOUTH OF CODY ON THE WYOMING STATE SHOOTING COMPLEX

PHOTO FROM Cody Schatz, P.L.S.

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HARROWER, PELS

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Advertising rates are as follows:	Year	Issue
Full Page	\$810	\$210
Half Page	\$540	\$140
Quarter Page	\$310	\$80
Business Card	\$40	\$10
Employment	Free	Free

Special Rates apply for PLSW Chapters and cover placements.

For more information please contact Jack Studley.

PRESIDENT'S MESSAGE

Hello again.

Summer is just flying by. I hope that you all have had a great survey season so far and have had some time to enjoy the great area that we live in.

There is not a lot to update you on from our last Board of Directors meeting. We continue to update the website and are still in the planning stages for Fall Technical this year.

We have over a hundred and fifty members of PLSW currently. I challenged each chapter director, and I will challenge each of you, to look at your chapters and see if you should nominate a Life Member or an Honorary Member from your group. We only have 1 Life Member and 10 Honorary Members in the books.

To be eligible for a Life Member, you need to have been a Member in PLSW for a minimum of ten (10) years and be over the age of 65. To be eligible as a Honorary Member, you need to be at least fifty (50) years old and recognized as an individual of superior stature in professional land surveying. Let's make sure these folks are recognized.

To prove that I do actually find survey corners in Wyoming, here is a picture of a cool stone I found while surveying south of Cody on the new Wyoming State Shooting Complex.

Until next time, please enjoy the remining time of summer and start getting prepared for fall hunting (and surveying).

Cody A. Schatz, PE & LS
President, Professional Land Surveyors
of Wyoming.



ANNOUNCEMENTS

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OF WYOMING

Board of Control

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MEMORANDUM

To: Board members
Abigail Boudewyns, Board Attorney
Board Staff

From: Cheryl Timm, Ex-Officio Secretary
Board of Control

Date: February 23, 2026

RE: Policy for submittal of maps to the Board of Control (BOC)

Please add this memorandum to your policy notebook regarding the submittal of maps to the BOC to accompany petitions for changes to water rights. This revised policy, adopted at the February 2026 Board of Control meeting, provides guidance on Chapter 5, Section 5 of the BOC's Regulations and Instructions regarding an "acceptable equivalent" to "good quality tracing linen."

Chapter 5, Section 5 of the BOC's Regulations and Instructions states that petition maps must be on "good quality tracing linen or an acceptable equivalent." Due to the increased difficulty of storing mylar maps and in an effort towards streamlining the Board's map submittal process the Board has determined paper to be an acceptable equivalent to "good quality tracing linen." Effective as of the date of the adoption of this policy, petition maps may be submitted to the Board on paper. Submitting electronic versions of maps during the petition review process is encouraged. All other existing rules regarding maps remain in effect.



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HINTS TO AUTHORS

Dear Readers:

The editors of Lines & Points wish to convey our gratitude to the numerous authors who have contributed photographs, technical and professional articles, and other information to be incorporated into the quarterly journal. In recent years, the assembly and redaction of the submitted materials has taken on considerable technical application of the various English language compilers, office suites, and "publishing suites". This means that the communication and transfer of information and materials arrive at the editors' desktops in a multitude of formats and styles, which sometimes are not compatible with the PLSW personal computers.

We, the editors, are setting forth some simple rules for submitting materials which, hopefully will simplify your efforts and make the transition to the published version simpler and less time consuming.

1. If you have any questions or comments, please contact S. Dennis Dawson, Publications Comm. Chm., (dennieandbarb@gmail.com) or Michael A. Flaim, Editor-in-Chief (mike.flaim@bresnan.net).

2. If an article contains any illustrations, photographs, graphs, or other graphics, please transmit them as separate individual files. You may also include the illustrations within your manuscript, but the image integrity/quality is degraded seriously when attempting to extract them from the manuscript to create a published digital image. The Editor-in-Chief states that a much better digital resolution is obtained from the separate, individual illustrations submitted.

3. All submissions (electronic and snail mail) should be sent to S. Dennis Dawson (4005 Snyder Avenue; Cheyenne 82001). It is recommended a second copy be sent to Michael A Flaim (1212 Southwest Drive; Cheyenne 82007). It is further recommended a third copy be sent to Dr. Herbert W. Stoughton (2821 Carey Avenue; Cheyenne 82001). Dr. Stoughton has spent over two decades as a technical review editor of two national surveying journals, and will provide editorial/redactory review for grammatical presentation and punctuation format. The criteria for acceptable conformity to grammatical usage and punctuation shall be governed by the U.S. Government Printing Office Style Manual (any edition is acceptable).

4. It is strongly recommended that all submissions be transmitted six weeks prior to the publication deadline. The publication deadlines are: 1 January; 1 April; 1 July; and 1 October, annually.

5. Lines & Points is the official publication for the Professional Land Surveyors of Wyoming. Therefore, hence forth there will be incorporated in the publication all formal announcements pertaining to official business of the organization and other announcements. This includes announcements for the Annual Meeting; state-wide membership meetings; seminars; and the Fall Technical Session. These announcements are to be submitted to the current PLSW Secretary/Treasurer (PLSW; P.O. Box No. 8; Cheyenne 82003), at least four weeks prior to the *Lines & Points* publication deadline in which the announcement will/shall appear. The PLSW Secretary/Treasurer will circulate the announcements to the PLWS Publication Comm. Chm./Chief Editor, and the PLSW Board of Directors.

6. Advertisers and prospective advertisers should communicate directly with the Publications Secretary (P.O. Box No. 8; Cheyenne 82003) about any advertisements and modifications.

CUMULATIVE INDEX FOR LINES AND POINTS

The Cumulative index has been prepared by Herbert W. Stoughton, PEPLS for Lines and Points and is complete as an index of all the Lines and Points issues. However, the actual assembly of all the available Lines and Points issues is incomplete and is planned to be available on the PLSW Website under the Lines and Points heading.

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Street Address _____ City _____ State ____ Zip _____

Telephone: _____ : E-mail: _____

Marital Status: _____ Number of dependent children: _____

Educational information and plans:

If an on-campus full-time student taking at least 12 hours of class credit and attending daily classes at least two semesters every 12 months, please list the College or University you are (or will be) attending during the requested scholarship period: _____

If you are not an on-campus full-time student, please detail, on separate sheet, how you are obtaining your education.

How many semesters of college education have you completed? _____

How many do you have left to complete for graduation? _____

What is your expected graduation date? _____ Type of degree? _____

Why field of study will your degree be in? _____

How many credit hours of surveying curriculum classes have you completed? _____ hours

Current or last available GPA: _____ from: _____ (list school)

For which school period (s) are you applying this scholarship? (up to two consecutive semesters)

Fall (Sep-Dec)

Spring (Jan-April)

Summer (May-August)

See attached instruction sheet for additional information to be provided on separate sheets.

The above information, including attachments, is true and complete to the best of my knowledge.

Signature of Applicant

Date

Submit scanned application to: Geno Ferrero. gferrero@jfc-wyo.com

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- **Excellent Benefits:** We provide comprehensive health insurance, a state retirement plan, and a culture that values work/life balance.

If you are a licensed PLS with a passion for leadership and a desire to see your work build a legacy, we want to talk to you. See the job description and apply at:

<https://www.governmentjobs.com/careers/wyoming/jobs/5255579/state-land-surveyor-2026-00630>

Working for the State of Wyoming offers more than a paycheck. Our total compensation package includes:

- Comprehensive health, dental, and vision insurance
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- Flexible schedules and work-life balance options
- Meaningful work that makes a difference for Wyoming communities
- and MUCH MORE!

LINES AND POINTS ARTICLE ROTATION SUBMISSION SCHEDULE BY CHAPTER			
Responsible Chapter	First Call Date	Last Call Date	Publication Date
West Chapter	THANK YOU! (see "The Stone Circle" in this issue!)		
Central Chapter	September 1	September 15	October 1, 2026
South Central Chapter	December 1	December 15	January 1, 2027
Southeast Chapter	March 1	March 15	April 1, 2027
Upper Platte Chapter	June 1	June 15	July 1, 2027
Southwest Chapter	September 1	September 15	October 1, 2027

Board of Directors discussed, any four page article (with pictures) may be from within the particular chapter membership (survey stories, or technical experiences) or after acquiring permission to use an article from another professional society publication or which provides information of interest to the PLSW members. The Board also approved assigning the responsibility for the article development and submission to each chapter's vice president. If a Chapter does not provide an article that same Chapter shall be obligated to provide an article for the next publish date.

The Stone Circle

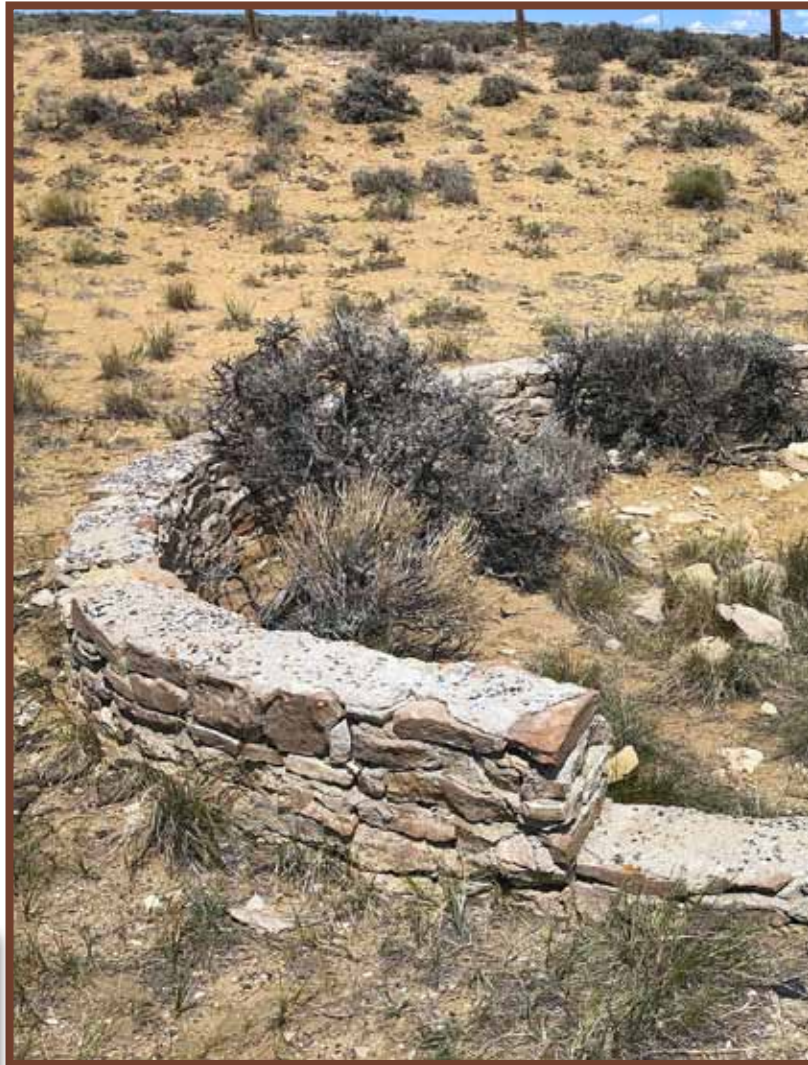
by Skylar V. Wilson, LS

PLSW – West Chapter

Those who travel WYO 28 (South Pass road) have likely noticed a circular stone structure lying north of the highway approximately 14½ miles northeasterly of Farson. It has the appearance of grouted shale or sandstone. Its outer diameter is 16 feet with walls 1 foot thick, standing 1½ feet above ground. It doesn't appear on any common maps and there are no descriptive signs around the monument to indicate its purpose.

But there are many theories, speculations, and stories about its origin and purpose. Perhaps the best summary of theories was compiled by Elizabeth King, from the Wyoming State Historical Preservation Society (SHPO), in an email thread she was a part of in 2013. She states:

"...We have been very interested in the rock wall in our office and have reached out to archaeologists working in the area, as well as WYDOT. Unfortunately, we still don't have a concrete answer! Different respondents had a different understanding of what that structure once was. Here are explanations we received:



(1) Retired WYDOT maintenance tech Jerry Godwin says that a small geyser/spring would flow from this spot and intermittently erupt. A seismograph crew went through the area in the 1960s or 1970s and set off explosives that caused the spring to stop flowing. In this scenario, the wall would have encircled the little spring.

(2) The BLM office in Rock Springs has been told that it is the remnant of a storm or blizzard shelter.

This idea has been shared with me by several local people. They called it a warming hut, or line shack. It's possible, but if so, it would need walls and a roof to actually provide shelter and warmth. Wood would most likely be the building material of choice. A closer look at the top of the walls show a curved grout cap. This would not be the typical shape if wooden walls were intended to be placed atop the stone foundation. This may argue against the warming hut theory.





Here are a few more tidbits courtesy of WYDOT:

(1) The present alignment of WY28 was constructed in 1941. The rock wall is not shown on the 1940 plans despite being in the right-of-way. It is also not shown on the 1982 plans when the highway was overlaid. WYDOT thinks the rock wall probably pre-dates 1941.

The original WYDOT construction plans have not been viewed by this author. A friend checked the Cheyenne office and can verify that their copies of the plans do not show the structure. This seems slightly strange because WYDOT apparently thought the structure was important enough to leave in place, even though it doesn't appear to have any function regarding the highway. And it is a mild hazard.

WYDOT's Pinedale field office has copies of all construction plans located in their jurisdiction. On a lot of the older plans, hand-drawn notes have been added, usually about structures or other features that don't appear on the official plans. These annotations almost never make an appearance on Cheyenne's final as-built copies. It might be worthwhile to look at the plans in the Rock Springs office, and maybe the Lander office.

(2) This is currently BLM land and was never homesteaded.

A check was made of the 1885 GLO plat and notes (there are none more recent) in the area to see if there was any mention of the structure. There wasn't. There were a couple of old stage roads shown, but not in our area of interest. The stone structure probably didn't exist at that time.

This fall, two of my coworkers who have extensive experience in evaluating buildings and structures stopped to look at the rock wall in person on a trip to Pinedale. They observed that there is a slight depression in the soil at the center of the circle. They also feel strongly that the construction of the wall is not of adequate strength to act as a foundation and would definitely not be able to retain water. There are no signs, such as nails or wood fragments, that a superstructure ever existed. There are the remnants of what look like asphalt pads to either side of the wall. The wall is very crude and utilitarian in construction. The "threshold" seems designed to give access to the center of the circle.

A site inspection was made recently. A search for ferrous objects was made inside and outside the structure. There were no hits. The Schonstedt detector is for ferrous metals only, so it wouldn't have picked up any brass, silver or gold. The hope

(3) An archaeologist who has worked in the area for many years was told that the wall used to encircle a meteorite that was found at the spot. The meteorite was supposed to be taken to a museum but disappeared a few days before it should have been transported.

This idea is kind of amusing. There is that small depression in the center. It's theoretically possible a small meteorite used sit in that position.

(4) Tom Bell wrote in the Wind River Mountaineer (a publication of the Fremont County Museums) that it is the remainder of a small cistern used to store water for desperate motorists whose cars had overheated. Water was hauled to the location by the county road departments.

Another possibility, but as is noted below, this structure is not waterproof. So if the county road departments were hauling water to the structure, they would have had to put the water into separate containers, not just dumped into the stone structure.

was to find maybe some structural iron materials, or perhaps an old sign. Speaking of which, a friend said he remembers seeing a sign there that said something about the Pony Express. This sounded intriguing. But research showed the Pony Express was only in operation for 18 months, between 1860 and 1861. That's way too early for our stone circle.

Based on their observations, we feel that the first scenario, that of the former spring, is most plausible. The wall may have been intended to draw attention to the water source without necessarily retaining any of the flow. We feel that it is highly unlikely that the county road departments transported water to the site, as the water would have seeped into the ground, evaporated, or leaked from the wall..."

The spring theory seems reasonable. But the volume of water would have had to be pretty low. Even though the structure is not waterproof, a decent flow would probably fill the circle up to the "threshold," as Ms. King calls it, and would then flow through that cutout. This faces the highway directly. WYDOT would not want a high-volume or steady flow of water running against the road base.

Some readers may want to look at the stone circle on the Internet. Here are the coordinates: 42°13'15.7"N, 109°12'09.4"W. These aren't survey grade, but close enough. Plug them into either Google Maps or Apple Maps. They both have street view options that are pretty good.



Looking southeasterly. The paved shoulder of WYO 28 is 18 feet from the outer wall of the stone circle.

Thoughts on Professional Practice and Education

Article 13: Pursuit of Graduate Education

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

This is the thirteenth article I have prepared in the series offering thoughts on professional practice and education. In this article I am going to give my thoughts on obtaining graduate education. I will define graduate education as any education earned beyond the undergraduate bachelor degree.

I will start with the premise that graduate education is not necessary for a rewarding and successful surveying career. I would even go so far to state that for many surveyors, obtaining graduate education will not gain an economical return on the investment. Finally, I will readily admit that there are numerous surveyors without a graduate education or even an undergraduate degree that are far more intelligent than many people with graduate education including more intelligent than me. In other words, three graduate degrees does not make me more intelligent than many surveyors without a degree. If you are content with your position in the profession, your future, and your prospects, you do not need to consider graduate education.

There are three reasons to embark on graduate education. The first is to expand the depth of your knowledge. This would be accomplished by obtaining advanced education in surveying. The second reason is to expand the scope of knowledge. Expanding the scope of knowledge would occur by obtaining advanced education in a discipline other than surveying such as business administration, law, public administration, civil engineering, or forestry, as examples. The third reason is to qualify for other employment or licenses. For example, a graduate degree is generally required for a tenured college faculty position.

As a consequence, a person with an undergraduate degree in philosophy that decides to pursue surveying, may wish to consider getting a graduate degree in surveying rather than an undergraduate degree in surveying. A person with a surveying degree may wish to obtain a graduate degree in business administration.

The first graduate degree is generally a master's degree (e.g., Master of Science, Master of Arts, Master of Business Administration). The master's

degree tends to focus on a specific discipline. There is little, if any, requirements when obtaining a master's degree for earning non-discipline specific courses to provide for a 'rounded' education. Thirty credits are generally required for a master's degree. Some of the credits may be awarded for research and thesis. The thirty credits may be composed entirely of surveying or surveying related coursework.

For the person interested in graduate study, there are two decisions that must be made. The first decision is to decide the focus of graduate study. The person must decide if studies will be in surveying or another field such as civil engineering, business, law, etc. The next decision is to decide the intensity of study. What I mean by intensity of study is the goal of graduate education. The easiest route for graduate education is to obtain a graduate certificate in a certain field. A graduate certificate at the University of Maine requires 12-15 credits of study, depending on the field of study. The next level of intensity is a master's degree that generally requires around 30 credits of study. Finally, a doctorate requires 42 to 90 credits of study beyond the bachelor's degree. In some cases, a person can achieve the ultimate goal of obtaining a graduate degree by taking smaller steps. For example, the credits used to obtain a graduate certificate can later be used to obtain a master's degree. The credits obtained in a master's degree can often be used toward a doctorate. There are exceptions such as a law degree where there are no intermediate goals toward obtaining a juris doctorate (law degree).

A student that seeks to embark on graduate education should be aware that many graduate programs will not accept or only accept a limited number of credits from another university. For example, a university that requires 30 credits of graduate study to obtain a master's degree may only accept six credits from another university. The program would require 24 credits be obtained at the university awarding the graduate degree.

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

Status of Surveying and Mapping in the United States

Final Report of the Task Committee on Status of Surveying and Mapping of the Surveying and Mapping Division

Endorsed by Executive Committee of Surveying and Mapping Division as Amended: October 15, 1958.

A. General Background of the Problem

In the past decade, certain problems relating to the professional status of its surveying-mapping members prompted the American Society of Civil Engineers in 1954 to inaugurate a study of surveying and mapping activities in the United States. A Task Committee on Status of Surveying and Mapping was appointed to report on two questions:

- a. Which parts or activities of surveying and mapping are professional, and which are not?
- b. Which parts or activities of surveying and mapping are engineering, and which are not?

These two questions have been under close scrutiny now for nearly four years, and herein are presented the results of various phases of the study.

Ethical Considerations

The problems that prompted the action mentioned above were typically these:

- a. Certain federal surveying-mapping agencies (e.g., Corps of Engineers) and state and municipal bodies were seeking to contract for the hire of surveying personnel on a competitive-price basis, a practice that many ASCE members reported as violating the ASCE code of ethics;
- b. Contracts for preparation of topographic maps by use of photogrammetry were frequently awarded to corporations on a competitive-price basis, again suggested as a violation of ethics.

Other problems of a minor nature and similar thereto, not the least being the recurrent question of admitting land (property) surveyors to engineering license or to engineering societies, added weight in favor of the study.

Committee Personnel

The Task Committee is composed of three members: representing federal mapping agencies, Mr. George D. Whitmore, Chief Topographic Engineer of the U.S. Geological Survey, Washington; representing private practice (or industry) Mr. Alfred O. Quinn, Chief Engineer of Aero Service Corporation, Philadelphia; and representing engineering education, Brother

B. Austin Barry, Associate Professor of Civil Engineering at Manhattan College, New York, as Chairman.

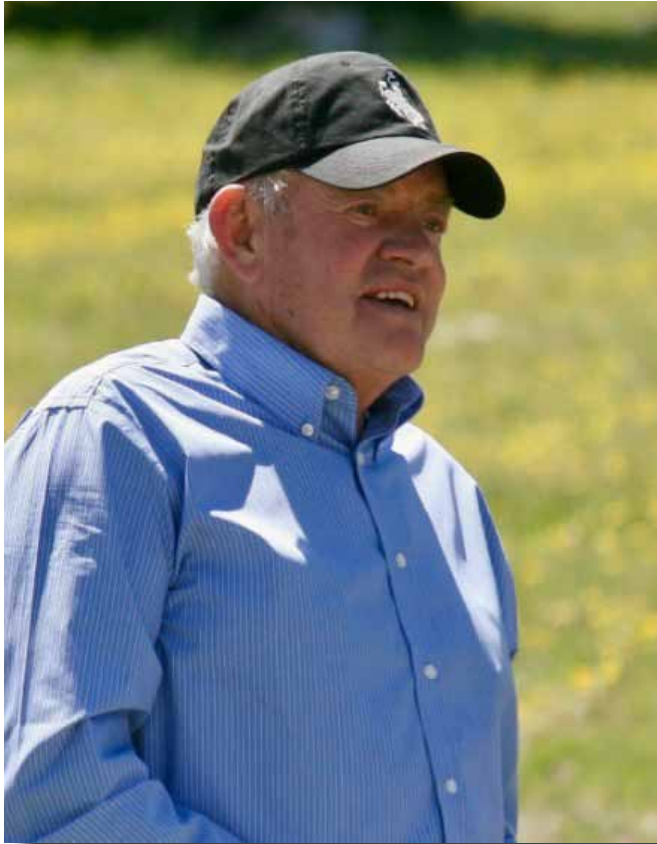
B. First Report (1955): What in Surveying is Professional

At the start, it was found necessary to ascertain a good definition of the term professional. In the first report ["Professional Aspects of Surveying and Mapping"; 24 October 1955; *J Surveying and Mapping Division, American Society of Civil Engineers*; Paper No. 921; V. 82, No. SU 1; March 1956] the Task Committee cited four distinguished authorities and noted that, among other attributes, these are primarily the distinguishing marks of a profession (or of professional work):

- a. It is of a high intellectual nature;
- b. It must require the exercise of judgment and is not subject to standardization;
- c. It must satisfy an important social need;
- d. It has a body of advanced knowledge (science) and an art (skill) not commonly possessed by the general public;
- e. Its practitioners are usually prepared on the college or university level in a specialized intellectual technique (as well as in general areas of learning);
- f. Its members must have a motive of service, assume relations of confidence, and accept individual responsibility;
- g. There must be some social recognition and regulation of the profession.

On the basis of these characteristics, all categories of surveying-mapping activity were studied and the individual job classifications were designated as professional-level, technician-level, or preprofessional-level in nature. Definitions were also included for each professional title in the attached classification chart (Appendix D). In each case, the professional person is distinguished from the technician, who usually works under the direction of a professional.

(Continued on Page 17)



Robert 'Bob' Allen Harrower (PELS 625)

Dec. 13, 1936 - May 13, 2026

On May 13, 2026, the dogs were called and the fire extinguished when Bob Harrower passed away surrounded by family at the age of 89.

Robert Allen Harrower was born on Dec. 13, 1936, to James King and Alice Harrower of Pinedale, Wyoming. Bob's first home was the remote Willow Creek Ranger Station near Cora, Wyoming where his father worked as a forest ranger. The family moved into Pinedale to allow his older siblings to attend school, and Bob grew up hunting, backpacking, skiing, and mountain climbing. Bob graduated from Pinedale High School and then attended the University of Wyoming and earned a degree in civil engineering. Bob was a multi-year varsity letterman on the University of Wyoming downhill ski team. He also participated in the University's mountaineering club and climbed numerous notable peaks throughout Wyoming and the surrounding states. These included Gannett Peak and the Grand Teton and he was also invited, along with his brother Jim and life-long friend Courtney Skinner, to climb Devils Tower National

Monument during the 50th anniversary celebration. Also notable was his participation within the recovery efforts for the remains of the sixty-six people that perished when United Airlines Flight 409 crashed into Medicine Bow Peak in 1955, the biggest air disaster within the United States at the time.

Upon graduating from college, Bob participated within an Antarctica expedition, backpacked and hunted in New Zealand, and toured such locations as Australia, Thailand, Hong Kong, and Singapore. He finally began to make his way back to more familiar country, landing in Alaska where he flew float planes prior to making his way to Seattle where he then hitch-hiked back to the University of Wyoming and earned a Master of Engineering in Structural Engineering. It was in Laramie that he met the love of his life and married Karen (Bjorn) Harrower and started a family. He worked numerous engineering jobs around the country from New Orleans to Philadelphia, focusing primarily on nuclear power plants. Upon returning to the Cowboy State, he and his family first lived in Opal, then on a remote ranch on the Hams Fork near Kemmerer and finally returned to Pinedale where he started Rio Verde Engineering and worked jobs over the entirety of the Mountain West. He also served as the town engineer where he provided most of his services for free and volunteered his time and expertise to help construct the Museum of the Mountain Man. Bob continued to enjoy the outdoors through skiing, camping, hunting, and taking pack trips with his family. His wanderlust did not completely subside, and he participated in such events as a Friendship Flight that found him assisting his brother Jim to pilot a Helio Courier bush plane from Alaska to Russia that celebrated citizen diplomacy and shared World War II alliances.

He also continued his lifelong passion for restoring antique automobiles. Bob meticulously restored numerous Ford Model Ts, various buckboard wagons and horse drawn sleighs, and numerous other tractors, trucks, cars, gas pumps, hit and miss engines, and related memorabilia. Bob was never at rest, always working on his projects, improving his property alongside his wife Karen, sharpening his knowledge of local history, rooting for the Wyoming Cowboys, and espousing trademark witty quips.

Bob was preceded in death by his wife Karen, his brother Jim, and his sister Jean. Bob is survived by his daughter Kristin, sons Kim (Maura) and Heath (Sara), his younger sister Ruth (Pete) of Cheyenne, four granddaughters, and several nieces and nephews. A small memorial will be planned for this summer in Pinedale.



Adam Jacob Schroeder

Jan 10, 1985 - May 20, 2026

Adam was born on January 10, 1985 and grew up in Fulton, IL. As soon as he could walk, he was on the move and he never slowed down. He ran a paper route (and saved an elderly customer's life), built a lawn care empire, and worked any odd job a farmer would give him.

He earned his degree in land surveying from Southern Illinois University and he truly found his calling. He spent many years working for Willett Hofmann in Dixon, IL before chasing his dreams of moving west, where he worked with Inberg Miller in Cheyenne, WY.

When he wasn't working, Adam enjoyed hunting, horseback riding, attending rodeos, or helping out on a friend's farm.

Adam never met a stranger and could talk to anyone he met. His smile was infectious. And the twinkle in his eye let you know that he was up to something.

After a battle with illness and pain, Adam went to his heavenly home on May 20, 2026, and found his peace. He was surrounded by much love in his final days.

He was preceded in death by his father, Dennis Schroeder, uncles Allen Schroeder, Roland Balk, and Dale Balk, as well as all of his grandparents: Jacob & Dorothy Balk, Louis & Jennie Buikema, and Harvey & Ruth Schroeder.

Adam will be missed greatly by his mother Denise Schroeder, sister Nicole (& husband Daniel) Rose, nephew Elliott, and partner Dawn Marie. And of course the many, many people who knew and loved him.

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(Continued from Page 14)

Professional vs. Technician

The tenets used for the differentiation throughout the study are as follows:

Professional Level: Work that involves the exercise of professional judgment, frequently based on knowledge acquired through higher learning, generally non-routine in character. The term implies one who can plan, perform, and/or direct all such operations in the category; the person is responsible for work performed by those under him.

Technician Level: Work that is primarily routine, of a technical nature, often demanding a high degree of skill, done under the direction of a professional person who is responsible for its outcome. Such work is pre-professional when performed by a professional trainee who, having completed courses of specialized intellectual instruction and study, is seeking to attain professional status.

It might be appropriate to state that such a differentiation between professional and technician had not previously been made, but that its acceptance upon publication was

unanimous, indicating that such is a very natural pattern of human behavior. Similarly, while no comprehensive classification of surveying-mapping activities had ever been published, the six categories shown met with general approval as well. The Task Committee submits this Classification Chart as part of its present final report (See Appendix A).

C. Inter Report (1956): What in Surveying is Engineering

Having completed the initial phase of the study, it became necessary to determine which of the six categories of activity are properly engineering activity. In October 1956, the Task Committee (Interim Report) ["Second Interim Report of the Task Committee of Status of Surveying and Mapping"; 18 October 1956; *Civil Engineering*; March 1957] listed its findings, as follows:

1. Land or Property Surveying (Cadastral) was stated to be separate and distinct from engineering, as determined from the official pronouncements of two groups:

(Find the remainder of this article and it's Appendixes within the July 2026 (Vol. 37: No. 3) link on the website at:

<https://www.plsw.org/lines-and-points/>)



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- a. In 1948, the statement of the National Council of State Boards of Engineering Examiners (NCSBEE). (See Appendix A.)
- b. In 1952, the resolution of the National Society of Professional Engineers (NSPE). (See Appendix B.)
2. Engineering Surveys (for Design and Construction), because widely recognized as engineering, were identified as engineering;
3. Geodetic Surveying, Geodetic Engineering, or Geodesy was listed as engineering work in nearly its entire scope;
4. Cartographic Surveying, Cartographic Engineering, or Map and Chart Surveying was called engineering because so determined by the NCSBEE, the NSPE, and by a 1952 statement of the ASCE Board of Direction, as also because so adjudged generally by various state boards of engineering registration. (See Appendices A, B, and C.)
5. Aerial Survey Services (adjunct services not necessarily linked to photogrammetric mapping) were listed as non-engineering;
6. Cartography (map compilation from other than original surveys, map finishing, map reproduction) was listed as non-engineering.

Reaction of the Profession

Efforts to publicize these findings widely resulted in many responses from all parts of the United States. The land surveying statement caused by far the greatest discussion, with many groups and individuals strongly endorsing the stated view and with just as many others objecting thereto with equal vigor. Many analyses were made by land surveying groups, state and regional, but no general agreement was found to exist among them.

At this point, the American Congress on Surveying and Mapping (ACSM) became greatly interested and attempted to act as spokesman for land surveyors throughout the nation. At the suggestion of ACSM, Mr. Victor H. Ghent, land surveyor from Virginia, became an associate member of the Task Committee to act as ACSM liaison and to offer counsel in the deliberations. Mr. Ghent's aid is hereby gratefully acknowledged.

D. Second Interim Report (1957): Modification re Land Surveying

With a fairly unified opinion across the country concerning the categories II through VI, but with a general lack of accord on category I, Land or Property Surveying (Cadastral), the report of October 1957 (Second Interim Report) of the Task Committee ["{Second Interim Report of the Task Committee on Status of Surveying and Mapping"; 18 October 1957; not published] was a restatement of its October 1956 findings, with a single exception. The change, concerning category I, was this statement:

We find that more than half of the profession (including a national committee of surveying teachers believe that Category I (Land Surveying-Cadastral) should continue to be regarded as a branch of civil engineering ... We must therefore retract the recommendation of 1956 that land surveying be regarded as an activity separate and distinct from engineering.

With an unsettled question of such magnitude facing it, the Task Committee immediately presented (in form of an Appendix attached to the Second Interim Report) a partially developed thesis that would “retain” land surveying as a part of engineering. There began simultaneously a severe scrutiny by the Task Committee of all the reasons for retaining any part of surveying within the domain of engineering, especially for retaining land surveying (property) surveying. The present report. is the result of this scrutiny.

E. Findings of the Present Report

Primary and basic attention was given to the fundamental question, “Does the practice of Surveying and Mapping as defined and categorized by this Committee constitute the practice of Professional Engineering?” Two facets of the problem were seen to be important: (1) recognition by the engineering profession, and (2) recognition by the legally constituted bodies, i.e. the various state laws and boards of professional licensing.

A review of the registration laws for professional engineers in the country indicates that a uniform and clear-cut decision has not been made. Some states, such as Pennsylvania, specifically include surveying (and mapping) as a part of the basic definitions of professional engineering practice; others have no reference to surveying-mapping in their laws; and in still other states, opinions by Attorney Generals have excluded all or parts of the Surveying profession from engineering and the requirement for licensing.

Since a lack of uniformity of state laws and rulings exists, the Task Committee felt that the basic definition and resolution of the professional status of surveying and mapping should emanate from the engineering profession itself. When the engineers have placed surveying and mapping in its proper professional position, a positive statement can be made to the licensing boards to attain legal recognition.

As a result of thorough deliberations and widespread consultation during the past year, the Task Committee feels they it is ready to present in this final report, certain findings on matters not covered in the prior interim reports. The findings are followed by a series of conclusions, and concomitant recommendations. The recommendations collectively constitute, in effect, a policy position for ASCE as principal spokesman for the civil engineering profession, as well as a program of action for state registration boards, engineering schools, ASCE’s Surveying and Mapping Division, other professional societies, and individual engineers and surveyors throughout the country.

Basic Considerations

From a fundamental point of view, the practice of engineering includes the use and recognition of the properties of matter and the sources of power in nature to provide tools, structures, machines, and conveniences useful to man. This broad scope of activity demands the professional services of persons schooled and skilled in the basic laws of nature and materials to successfully apply engineering principles. The Committee concludes that the application of the engineering concepts of mathematics, astronomy, mechanics, physics, and human management as practiced by persons engaged in activities defined in categories I, II, III, and IV of this report constitutes the practice of professional engineering. The investigation, planning, design, and responsible supervision of surveying operations, the construction of surveying equipment and/or systems, and the location, delimitation, and delineation of natural and physical features on the surface of the earth fulfill the requirements for engineering practice. The exercise of these responsibilities does require higher and professional education which the Committee believes must be satisfied by the completion of an engineering curriculum in a college or school having adequate equipment, resources, and professional instructors to provide at least a four-year program.

Re Land Surveying

The place in engineering of our category I, Land Surveying (Property, Cadastral), is the subject of greatest controversy throughout the country and of greatest concern to the Committee. The principal facts relevant to the matter seem to be:

1. A substantial majority of the civil engineering profession throughout the United States firmly believe categories II, III, and IV to be engineering.
2. However, with regard to category I, probably a majority of the profession feel that property surveying should be considered engineering and be "retained" within the branch of civil engineering. Many others believe that this category of work, whole admittedly fully professional in nature, should be splintered off from engineering and be allowed to form into a separate professional group.
3. Probably a majority of private-practice property surveyors are also licensed (registered) as professional engineers, which seems to work out very well in practice, as both capabilities are required on many projects and, in any case, they tend to be complementary activities.
4. Others in private practice not so dually licensed usually find it necessary, in order to stay in business, to combine property surveying with certain auxiliary jobs that are generally considered to be engineering, e.g., subdivision development and construction layout.

The Task Committee believes, so far as the surveying and measurement sciences are concerned, that property surveying in the future will necessarily become increasingly more precise and complex, and will necessarily utilize geodetic, photogrammetric, electronic, and other advanced procedures. The Committee feels that the measurements made to ascertain the size and shape of the earth, as well as those to ascertain a distance between two points three hundred feet apart, are part of the same science. Similarly, surveying for the topographic plan for a 2-acre plot is part of the same science as mapping an entire State, although the specific techniques be different.

The Task Committee therefore advocates that the practice of property surveying (usually referred to as land surveying in state registration acts), be considered to be an integral part of surveying and mapping complex, and consequently of engineering. As a corollary, the Task Committee also advocated that a basic engineering education, preferably with some emphasis in the surveying and mapping sciences, should be prerequisite for all land surveyors of the future, as it should be also prerequisite for those who specialize in any other categories of surveying and mapping.

While admitting that property surveying and survey engineering are thus basically akin, identified in fact, the Task Committee here points out an additional important requirement for an engineer engaged in property surveying: a knowledge of property law and of local conditions. As has been established, all who wish to practice property surveying should be basically engineers (and should be equipped with the B.C.E. degree or equivalent) because of the similarity of the knowledge and tools needed for both, and there should be no need for a separate L.S. examination and registration law.

It is most important, however, for all to recognize the peculiar nature of surveying, which demands a specialized knowledge of property law and of local conditions. Because of the particular conditions that exist in many states in regard to land surveyors, platting laws, recording laws, etc., it is felt that each state must work out for itself the most practical methods of transition from land surveyor and professional engineer licenses to the single professional engineer license.

We envision that in the future it will be imperative that engineers be very careful, therefore, in judging their own competency to practice property surveying. This will require a renewed sense of ethics within the profession, but we are strong in the belief that without such a proper ethical basis a profession cannot exist.

Re Photogrammetry

In view of the past controversies regarding the place photogrammetry in topographic surveying and mapping, and in engineering, it is felt desirable to repeat here in some detail the views of the Task Committee on this matter.

It is the Committee's judgment that the use of photogrammetry involved in making a topographic

plan or map, for example, is engineering work. However, certain adjunct survey services (e.g., obtaining aerial photographs, etc.) in themselves are regarded as non-engineering. The findings of the Task Committee regarding photogrammetric activity are simply stated in the Interim Report: "The photogrammetric methods of Categories T, II, III, and IV are engineering procedures by reason of their being operations of an engineering project, e.g., the preparation of a topographic map."

Certain difficulties seem to surround this concept of photogrammetry as a procedure, for some persons would have the method divorced from engineering and become a profession by itself.

It is the view of this Committee that the topographic plan or map, aside from its inherent value as an engineering instrument when completed, is itself a project that is engineered in its construction. The basic elements of lineal and angular measurements, and the selection of the proper instruments and procedures for each of the succession of operations beginning with horizontal and vertical control, must be commensurate with the purposes of the product. As the concept of measurement evaluation is essentially the basis of engineering, we hold that the topographic plan or map, whether or not produced mainly by means of photogrammetric surveying (or any other surveying method yet to be devised) rather than traditional ground surveys, is an engineered accomplishment.

Furthermore, it should be noted that a topographic plan or map is an engineering instrument, a basis on which engineering design is to be based, and that production of such topographic plan or map is undertaken for the value it will have for engineering planning and design for such as highways, dams, reservoirs, irrigation systems, drainage systems, industrial sites, subdivisions, etc. Vast sums of design and construction money will be expended on the basis of the map's information. Only in the measure that the plan is reliable can it be of any use, and it is manifestly impossible for the user to check the entire map for reliability without inordinate expenditure of time and effort. The reliability therefore is something that must be worked into the map by professionally accepted methods, competent and informed personnel, precision equipment, and (primarily) engineering planning and supervision at every stage of the process. It would be unwise to entrust the basic mapping of terrain and culture at any useful engineering scale to persons lacking a sense of plotting accuracy and of the implications of map error (and blunder).

It is well to remember that the use of aerial photographs in the surveying and mapping field has brought about the development of the science of photogrammetry. The original service offered by practitioners was almost exclusively that of taking aerial photographs (classified as non-engineering) and it became common practice to obtain this service through competitive bidding. Later, when photogrammetric survey operations were added, competitive bidding was continued even when highly accurate, detailed surveys, and topographic plans and maps were a major part of the contract. The continuance of the competitive bidding practice also can be attributed to the relative newness of the photogrammetric methods (though European countries have utilized basic principles for many decades), and the consequent reluctance of public bodies to risk money on untried procedures. The Committee is confident that persons who specialize in photogrammetric surveying procedures will welcome a clarification of their status and the recognition of their work as professional engineering, and that this should ultimately eliminate the practice of competitive bidding from this activity.

Re New Umbrella Term

The Task Committee believes that Categories II, III, and IV clearly form the content of the "earth-measuring" sciences. We find, further, that Category I, Land Surveying (cadastral) falls into this concept and, as recommended herein, should henceforth demand that its practitioners be engineers with specialized additional training and background. Thus we find that this field may well include geodesy, topography, hydrography, photogrammetry, engineering and construction surveying, property surveying and the like.

Heretofore much reliance has been placed on the term "surveying and mapping" as a overall

designation, although the term “cartography” was also used for a few years by Government agencies under instructions of the U.S. Civil Service Commission. We find that “surveying and mapping” as a designation is not only cumbersome, but falls short of conveying the proper meaning. The term “cartography” never found full acceptance among surveying-mapping practitioners in the United States.

The Task Committee therefore has attempted to find an appropriate name for the entire content of these “earth-measuring” sciences, a term which would serve to denote the entire field of Categories I, II, III, and IV. To date no agreement has been reached on a new umbrella term but the most appropriate names seem to be there three:

1. Survey Engineering, as proposed in an early report, meets with favor by many.
2. Geodetic Engineering, is the name acceptable to many others, although its basic weakness as a designation for the entire field stems from its being already the designation of one of the parts of the whole. European practice might be pointed to as a precedent for its use, however.
3. Geometronic Engineering, a term coined by Walter S. Dix, A.M., Am. Soc. C.E., and Secretary of A.C.S.M., meets with considerable favor by many persons although it is so new and untried that its use in this sense must be regarded as highly tentative.

The Task Committee offers these three terms for consideration without advocating any, recommending, however, that an umbrella designation is needed and should be used in referring to the work of the first four categories. Throughout the remainder of this report the term *survey engineering* is generally used, though such use is intended to be without prejudice to either of the other terms or to any other acceptable designation.

Re Education

In the deeper study of surveying and mapping during the past year, two significant and pertinent trends have become apparent to the Task Committee:

1. Engineering as a profession is beginning, more than ever since its inception 150 years ago, to emerge clearly as a scientifically-oriented profession. No longer is it based primarily upon the art (the how-to-do), but is now assuredly founded on the principles of science. Educational institutions are rightly showing the way in this emergence of the new concept of engineering.
2. Surveying, concurrently, may be losing its place in the civil engineering curriculum, probably because:
 - a) in the past elementary surveying has been taught mainly as an art, or how-to-do course, the type of course now being eliminated in many schools; and
 - b) unfortunately there is now not sufficient time available in a 4-year degree program to include the variety of subjects currently required in advanced surveying and mapping courses.

We find that educational facilities for geodetic surveying (Category III) and cartographic (topographic and hydrographic) surveying-mapping (Category IV), though recognized widely as being engineering, have been neglected in the United States to a serious degree. There are only a few engineering schools where the work is taught in the undergraduate curriculum despite today's drastic need for scientific manpower in these two fields specifically. Since the educational facilities for housing the body of professional knowledge are essential to making a profession, we believe that in this instance the lack of sufficient courses in surveying-mapping subjects is a serious impairment of the profession.

Perhaps worse off from the educational standpoint is property surveying, for preparation therefor is not generally regarded as an obligation of the colleges and universities. The legal aspects of property surveying are of the greatest importance, and surely warrant at the least an elective course in a few schools.

We take this occasion to sound a warning that we may soon be caught up in a shortage of intellectually competent persons able to carry on the necessary, even vital, function of geodesy, photogrammetry,

topography-hydrography, and cadastral surveying on a professional level.

We find that the present usual method of studying these important sciences, mainly self study while on in-service training assignments, will only result in shrinking the body of knowledge. in losing potentially high-caliber persons in the field, in stifling research in a vital science, and in lowering the stature of a professional field.

Specifically, where should such a body of knowledge be housed? Although a few persons would prefer to see the field of surveying and mapping splintered from engineering and be given a fresh start in the colleges of arts and sciences, it seems clear that a large majority of the civil engineering profession would much prefer that the engineering schools continue to be identified with all of the surveying and mapping sciences, on the grounds that in content and method they are most nearly engineering (as opposed to being simple or basic science). Some educators have included the geodetic sciences among the recognized engineering sciences.

The Task Committee believes that the engineering schools are the proper place for the study of surveying and mapping, or geodetic sciences, especially in view of the enlightened shift of emphasis now current in these schools throughout the nation towards science-oriented curricula, plus the added factor of new knowledge of the geoid. The decrease of emphasis on the all of surveying in engineering curricula is not at all inimical to this recommendation in fact, such decrease may be the very means of providing time for the courses in geodetic, photogrammetric, cadastral, topographic, and other such fields.

Actually the operation, care, and adjustments of surveying instruments should be handled as the work of technicians and we commend the colleges that give specialized training and/or two-year college programs for such work. However, engineers' responsibilities are more properly defined as the planning, direction, and design of surveying and mapping operations.

The Committee agrees that the teaching of the highly specialized aspects of the survey (geodetic or geometronic) engineering field should be restricted to a relatively few universities. However, a course in basic surveying should be included in the curricula of all civil engineering colleges to provide fundamental concepts of geodetic relations, mensuration through the application of surveying techniques, the theory of errors, and the advantages, disadvantages, and restriction of various methods and techniques used in surveying and mapping.

F. Conclusions and Recommendations

The following conclusions and recommendations are presented by the Task Committee for approval and action by the Surveying and Mapping Division and for appropriate action by the Society's Board of Direction.

1. That the overall definition of the field of surveying and mapping comprising six principal categories: a) land surveying; b) engineering surveying; c) geodetic surveying; d) cartographic surveying; e) aerial survey services; and f) cartography, all as shown in detail in the attached classification chart (Appendix D) be accepted, and that the difference between professional-level duties and technician-level duties as proposed in the classification chart be recognized.
2. That the first four of the six main categories comprising the overall field of surveying and mapping should continue to be regarded as engineering, these being land or property surveying, engineering surveying, geodetic surveying, and cartographic surveying; that these four categories should be considered as comprising the field of survey engineering (or geodetic engineering, or geometronic engineering), which in turn should be regarded as a branch of civil engineering; and that all State Registration Boards, engineering societies, and similar professional-level experience in the field as professional engineering experience.
3. That, with regard to education in this field,

- a) All fully accredited civil engineering curricula should include adequate instruction in basic surveying by qualified personnel;
 - b) Some of the engineering schools throughout the country should provide an elective sequence of surveying and mapping subjects, available in the junior and senior years, totaling 16 to 20 semester hour credits, that would comprise, in effect, a major in survey engineering (or geodetic engineering, or geometronic engineering) within the B.C.E. degree, or alternatively, a B.S. degree in such engineering;
 - c) That at least one engineering school should offer graduate degree programs in the major specialities of the survey engineering field, such as: land surveying, geodetic, cartographic, and photogrammetric engineering;
 - d) That all employers of professional-level surveying and mapping personnel be encouraged to assist those schools that are willing to establish the educational programs listed in (b) and (c) above, by recommending promising students for enrollment, by offering part-time employment to the students, and by employing graduates of such programs.
4. That at some appropriate time in the future, those who wish to engage in the practice of land surveying and related engineering work should first be required to qualify for a professional engineer (P.E.) license, and that ultimately the right to practice land surveying in any given area would be a moral right based on professional competence and the engineer's code of ethics, rather than a legal right based on separate registration for land surveying; and that all State Registration Boards be encouraged by all concerned to move toward the goal herein envisioned as rapidly as circumstances permit.
5. That all national, state, and local societies or associations of engineers and surveyors be encouraged to cooperate for the purpose of bringing about as rapidly as may be practicable, the ultimate situations contemplated in several of the above items.

The Task Committee gratefully acknowledges the great assistance given by very many individuals and organizations who contributed their views and suggestions during the course of this study and in the formation of this report. We urge them and all who are interested in the profession to work toward the furtherance of the report's objectives as a means of strengthening the profession in the critical years of the decades just ahead.

Respectfully submitted,

Alfred O. Quinn

George D. Whitmore

Brother B. Austin Barry, Chairman

Task Committee on Status of Surveying and Mapping

Endorsed by the Executive Committee of the Surveying and Mapping Division,
as Amended, October 15, 1958.

Appendix I

Reference A

The report of the Committee on Land Surveying of the National Council of State Boards of Engineering Examiners (NCSBEE) dated 1948 reads thus:

Definition of Land Surveying.

It is the opinion of this committee that the profession of land surveying comprises the determination of the location of land boundaries and land boundary corners; the preparation of maps showing the shape and areas of tracts of land into smaller tracts; including the layout of roads and streets, and rights of way of same, to give access to smaller tracts; and the preparation of official plats or maps of said land subdivisions, in compliance with the laws of the states in which the work is done.

The profession of land surveying also includes the preparation and interpretation of land descriptions for incorporation in deeds, leases, and other legal documents, and the application and interpretation of U.S. General Land Office (now the Bureau of Land Management) and court decisions, as such decisions relate to original surveys and resurveys.

Land Surveying does not include engineering surveys, such as those required for the planning and construction of railroads, highways, airports, utility lines, and bridges, although the determination of the boundaries of the lands to be used for such engineering construction and the preparation of the legal descriptions of same is land surveying and engineering surveying.

The surveying necessary for the preparation of a topographic map is engineering surveying and not land surveying.

Reference B

Resolution #1-52 submitted by Land Surveyors Committee (NSPE) 1952

WHEREAS, it has long been held in this country that surveying is a form of engineering; and

WHEREAS, there necessarily exists a close relationship between the professions of surveying and engineering; and

WHEREAS, the profession of surveying itself involves both land or boundary line surveys and engineering surveys; and

WHEREAS, the line of demarcation and the responsibility for the performance of these functions of the surveyor have been a source of doubt and question, often to the detriment of those concerned; and

WHEREAS, a Committee on Land Surveying of the National Council of State Board of Engineering Examiners has officially propounded reasonable definitions of responsibility in this regard;

THEREFORE BE IT RESOLVED THAT:

The Land Surveying Committee of the National Society of Professional Engineers urge that the Board of Trustees of said National Society

(a) endorse said report of the National Council of State Boards of Engineering Examiners, a copy of which is hereto attached;

(b) urge its member State Societies to promote the use and adoption of said report by their State Registration Boards; and

(c) combine its influence and prestige with other interested organizations to promote a uniform, high level, surveyors' registration act throughout the states of this country, with a view toward qualifying registered surveyors in general for membership in the National Society of Professional Engineers.

Reference C

American Society of Civil Engineers Surveying and Mapping Division

Draft of a Resolution submitted by the Executive Committee of the Surveying and Mapping Division to the Board of Direction of the American Society of Civil Engineers, February 16, 1952, and passed by the Board of Direction at the New Orleans meeting on March 3, 1952.

WHEREAS: the U.S. Civil Service Commission has decreed, in effect that in the operations of the Government's surveying and mapping agencies there is no work that can be considered to be engineering; and

WHEREAS: surveying of all types, and particularly surveying for the purpose of providing data for the production of maps (including geodetic, topographic, hydrographic, and cadastral surveying, as well as surveying techniques utilizing photogrammetry and electronics) have long been considered to be a branch of engineering; and

WHEREAS: the Civil Service Commission's order may ultimately affect the standing within the engineering profession of many engineers outside of government service, including members of the faculties of educational institutions, members of private-practice organizations, and engineer employees of state, county, and principal governments; and

WHEREAS: it is believed that a clear statement on this question by the recognized leaders of the civil engineering profession is necessary before any organization can hope to challenge successfully the Civil Service Commission as to the justice and wisdom of its edict;

NOW THEREFORE BE IT RESOLVED THAT: in the opinion of the Board of Direction of the American Society of Civil Engineers, the planning, execution, and direction of the professional surveying activities that are necessary for the production of the Government's standard series of maps and charts, as well as similar work elsewhere, are professional engineering; and that the public interests which are dependent on the quality, consistency, and economy of such work will be best served if it is directed and performed, as much as possible, by professional engineers having appropriate qualifications.

Reference D

Definition of Professional Positions

As a guide to the terms for designating the several professional positions in the preceding outline, it is thought advisable here to include certain definitions. These accord generally with the accepted definitions given in the ASCE Manual No. 34, *Definitions of Surveying, Mapping, and Related Terms* 1954, but are altered somewhat to describe more clearly the particular job function envisioned in this outline.

Land or Property Surveyor determines location of land boundaries; prepares maps showing shapes and areas of land; divides land into smaller tracts, including layout of roads and streets and rights-of-way for same to give access to smaller tracts; prepares official plats or maps of such land subdivisions; prepares and interprets land descriptions for incorporation in deeds, leases, etc.

Survey Engineer obtains information for planning or developing an engineering project and estimating its cost, often recording such information in form of an engineering map or plat.

Geodetic Surveyor (or Engineer) plans, performs, or supervises high accuracy surveys as well as the computations and adjustments thereof, including such as triangulation, traverse, precise leveling, and astronomic observations, such surveys being of a magnitude that the required accuracy and precision can be obtained only through processes that involve figure and size of the earth.

Survey Engineer (Control) plans, performs, or supervises surveys and computations of horizontal

and vertical measurements involving complex network adjustments, etc.

Topographic Engineer plans, performs, or supervises the construction of topographic maps of any scale, contour interval, or accuracy specification, including all survey procedures and calculations required for such map construction; determines when and whether ground or photogrammetric surveys or various combinations thereof shall be used.

Photogrammetric Engineer or Photogrammetrist plans, performs, or supervises use of photogrammetric instruments and techniques in conjunction with various aspects of surveying, mapping, resource surveys, and the design of photo-interpretation systems.

Cartographer plans construction and compilation of charts and maps of small scale; assembles, evaluates, selects, and directs plotting of data therefor.

Map editor performs many functions of the cartographer; especially designs form and content of maps; designs criteria for symbolization and nomenclature; reviews manuscript maps as to accuracy, completeness, correctness, and conformity with establishment of standards.

The titles mathematician, electronic engineer, geographer, geophysicist, etc., are not defined here specifically, since they are primarily titles of persons in allied professions whose work only incidentally is in the field of surveying and mapping.

Classification Chart for Surveying and Mapping

	Professional Level***	Technician or Pre-Professional Level ****
I. Land or Property Surveying (Cadastral)		
A. Property and Boundary Surveys*		
B. Subdivision Surveys and Plats*	Land Surveyor	Instrument man
C. Public Land Surveys*		Computer
D. Surveys for Plans and Plats*		Draftsman
1. Architectural (Building Site)		Tape man
2. Tax Maps		Rodman
II. Engineering Surveys (for design and construction)		
A. Design Data Surveys (including Route Surveys)	Survey Engineer	Instrument man
1. Control, Horizontal and Vertical		Computer
2. Culture and Topography		Tape man
3. Profiles and Cross-Sections		Rodman
B. Construction Surveys		
1. Layout Surveys		
2. Quantity and Measurement Surveys		
3. "As-Built" Surveys		
a. Utility Surveys		
C. Mine Surveys		
III. Geodetic Surveying, Geodetic Engineering, or Geodesy (not to be confused with precise plane surveying)		
A. Control Surveys, First- and Second- Order Accuracy * * or	Geodetic Surveyor Observer	Instrument man
1. Horizontal: triangulation, traverse, electronic trilateration	Geodetic Engineer Mathematician	Computer
2. Vertical: spirit and trigonometric leveling		Gravimetric Observer
B. Geodetic Astronomy		Recorder
C. Gravity Surveys, Magnetic Declination Surveys, Figure-of-the-Earth Studies		Signal man
		Tape man
		Rodman

IV. Cartographic Surveying, Cartographic Engineering, or Map and Chart Surveying (surveys for constructing original maps and similar products)

A. Control Surveys, Third- and Fourth- Order Accuracy ** Engineer

1. Horizontal
2. Vertical

B. Topographic-Planimetric Surveys and Maps *

1. Photogrammetric Aero-Triangulation
2. Mapping Surveys
 - a. Ground-Survey Methods
 - b. Photogrammetric Methods
3. Field-Edit Surveys of Photogrammetric Compilations

C. Hydrographic Surveys **

1. Soundings: fathometer, hand-lead, sounding pole
2. Sounding Fixes: three-point, electronic
3. Wire-Drag Surveys
4. Tidal and Current Surveys

Topographic

Hydrographic Engineer

Photogrammetric Engineer

Survey Engineer (Control)

Geodetic Surveyor or

Geodetic Engineer

Plane-Table Operator

Instrument man Observer

Computer

Recorder

Draftsman

Geodetic Surveyor

Tape man

Stereo-Plotter

Operator

Observer

Recorder

Draftsman

Leads man

V. Aerial Survey Services

A. Aerial Photography

1. Photo-Interpretation

B. Electrical Measurements for distances and position fixes (shoran, etc.)

C. Airborne Magnetometer Surveys

D. Radar-Altitude Profiles and Elevations

Photogrammetrist

Photo-Interpreter

Electronic Engineer

Mathematician

Geophysicist

Photographer

Photo-Lab Tech

Photo Analyst

Computer

Electronic Tech

Magnetometer

Operator

Radar-Altitude

Operator

VI. Cartography (not requiring original surveys)

A. Map Design

B. Compilation derived from existing source data

1. Evaluation of Maps and Other Source Data
2. Nautical and Aeronautical Charts, Topographic and Planimetric Maps, Special-Purpose Maps, etc.
3. Photomaps and Mosaics
4. Relief Maps and Models
5. Radar-Prediction Charts

C. Map Editing

D. Map Production

1. Engraving or equivalent
2. Lithography

Cartographer

Geographer

Map Editor

Map Compiler

Mosaicker

Modeler

Engraver

Lithographer

Notes: * Photogrammetric procedures used when applicable on these and other activities.

** Electronic measuring procedures used when applicable on these and other activities.

*** See definitions following this outline. Titles listed are intended to be illustrative, not inclusive.

**** Including some which are normally skilled craftsmen but which sometimes, by reason of special training, are properly considered technicians, e.g. rodman, tapes man, leads man, signal man, etc.

Appendix II

Excerpts from the minutes of the ASCE Board of Direction in Los Angeles, Calif.:

February 1959 meeting

The Board VOTED the following actions with regard to the Final Report of the Task Committee on Status of Surveying and Mapping, attached as Exhibit 9:

(1) To Adopt as Society policy the statement:

The American Society of Civil Engineers, on the basis of thorough studies carried out by a Task Committee on the Status of Surveying and Mapping, declares that the following four major categories in the field of activity commonly designated as surveying and mapping are a part of the Civil Engineering profession:

- I. Land Surveying
- II. Engineering Surveying
- III. Geodetic Surveying
- IV. Cartographic Surveying

These categories are described in Reference D of the Appendix D of the Appendix to "The Status of Surveying and Mapping, Final Report, Task Committee on Status of Surveying and Mapping".

Further, the Society declares that professional and technician positions within these categories should be classified according to the chart, which is a part of the previously mentioned Reference D of the Task Committee's Final Report.

- (2) To refer the last paragraph of the above statement to the Committee on Membership Qualifications and the Committee on Professional Practice for study and report to the Board on appropriate implementation procedures in the MQC and the Local Qualifications Committees.
- (3) To refer the declaration "That fully accredited civil engineering curricula should include adequate instruction in surveying by qualified personnel" to the Committee on Engineering Education for study and report to the Board at the earliest opportunity with regard to detailed statements and implementation.
- (4) To refer declaration "The state engineer examination boards should give appropriate recognition to professional level experience surveying and mapping" to the Committee on Registration of Engineers for study and report to the Board at the earliest opportunity with regard to detailed statements and implementation

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