

SURVEYOR

HOODSIEER

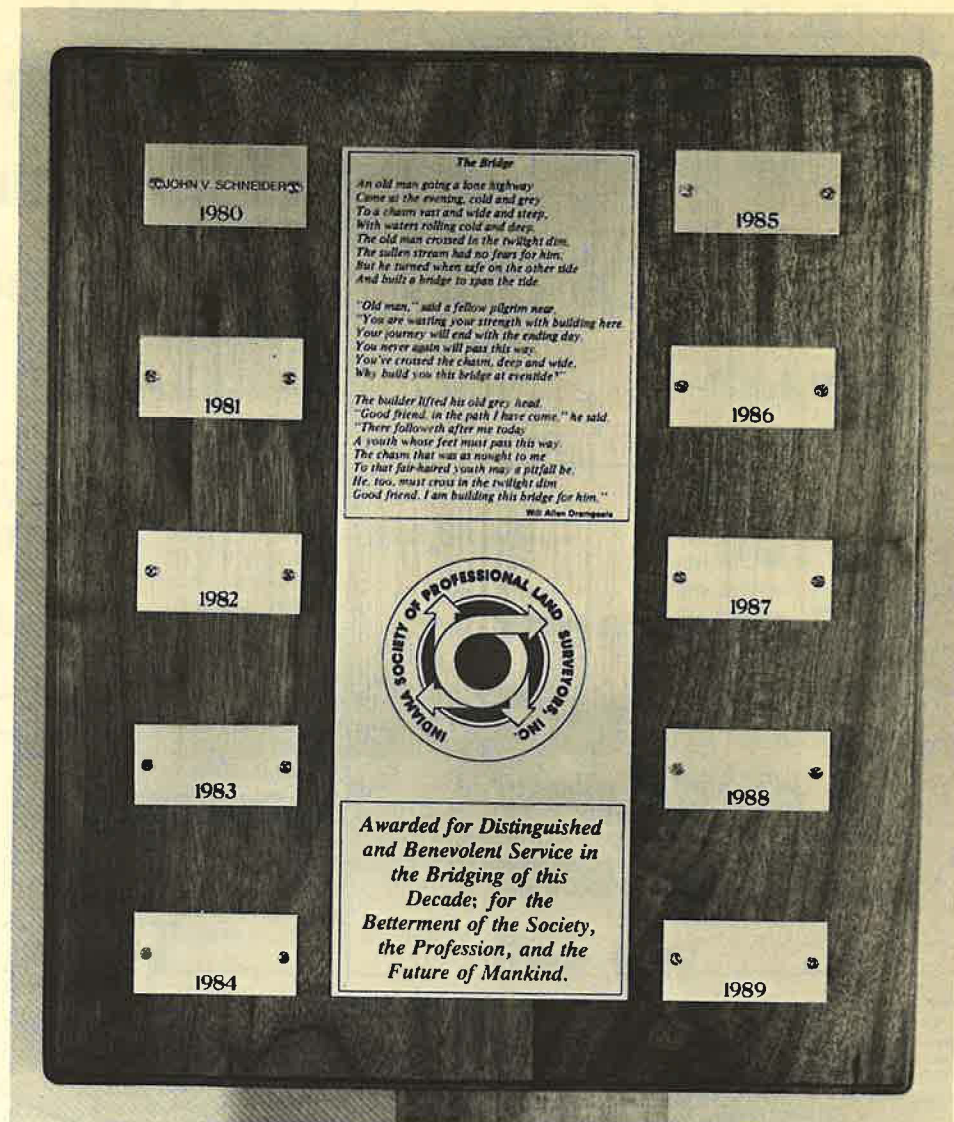


VOLUME 8
NUMBER 1
WINTER 1981



Indiana Society of Professional Land Surveyors, Inc.

Affiliated with the American Congress on Surveying and Mapping

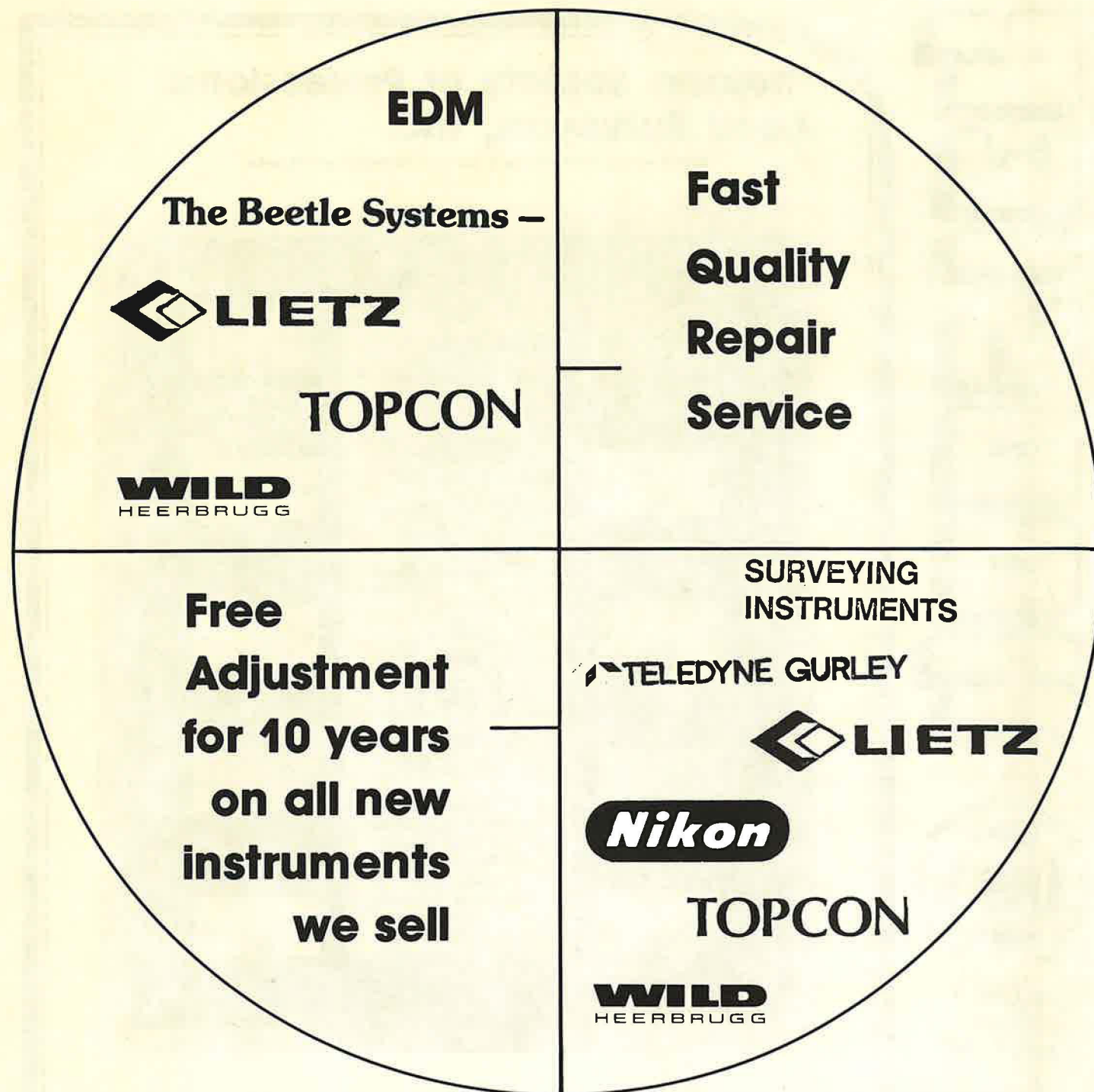


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STATE OF THE PROFESSION
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HOOSIER SURVEYOR

VOLUME 8, NUMBER 1, WINTER 1981

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COVER: ISPLS president, Chuck Budnick, announces the establishment of a new Special Award to be called the "Bridge Award" and to be awarded annually for the next ten years (1980-1989). It will be given to someone who exemplifies the spirit and philosophy of the poem "The Bridge" by Will Allen Dromgoole. The first Bridge Award (1980) was presented to past president John V. Schneider for outstanding and distinguished service.

EDITOR'S NOTE:

Deadlines for copy for various planned issues of the HOOSIER SURVEYOR are as follows:

Winter issue - January 31
Spring issue - April 30
Summer issue - July 31
Fall issue - October 31

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Kenneth S. Curtis
Editor

Gary Kent
Associate Editor

THE PRESIDENT'S PAGE

PRESIDENT'S MESSAGE

By C.A. Budnick

"THE STATE OF THE PROFESSION"

Although it is difficult for all of us to be objective about the current economic picture, given time, and the right governmental stimulus, this crisis will pass and we will once again return to a state of busy-ness.

The danger we face in this euphoric state is to lull ourselves into believing that "Good Times" are here again, and that we can all return to doing "Our Own Thing."

If we follow that path, I'm afraid that the Surveying Profession is in real peril! We must wake up to the reality that our foundations are being shaken or we may find ourselves again playing the role of Engineering Technician, and relinquishing our professional responsibilities to others.

As we sit here today, two groups, the Geologists and the Landscape Architects are actively working to upgrade their status by introducing bills that will allow them to perform mapping services.

Last Year, the Geologists were instrumental in getting a "Surface Mining" bill passed by the Indiana Legislature. This bill, like the federal bill it was patterned after, failed to recognize the surveyor as the only professional who should be performing mapping services.

Today, we are faced with the very real possibility that Title Companies might remove the Mortgage Inspection business from the hands of the private Surveyor.

Last year, a large Farm Bureau Coop in this state began offering in-house Land Surveying services to its customers.

This past fall, an over-worked and un-informed "Sunset" committee voted to retain the registration of Engineers and Land Surveyors. However, they totally ignored our request for a separate board.

These trends are not unique to Indiana. They are nationwide and, if they continue to go unchecked, we will be put out of business — by default.

Now is the time for the question — how did it happen and what can be done about it?

I believe that the cause and the cure are related. The cause being a lack of medicine; and the cure being more medicine.

The medicine I am speaking of is ATTITUDE.

We must change our posture from one of passiveness to one of AGGRESSIVENESS.

We must become ACTION oriented.

We must let the world know that we are not just property Surveyors. We are expert measurers, and any encroachment in this area will be met with heavy resistance.

We must stop apologizing for what we do, and we must stop being intimidated and brow-beaten by clients, and those in other fields while they walk away from the "closing" with all the profits.

We must not only keep our eyes on legislative and regulatory matters that are initiated by others, but we must TAKE THE OFFENSIVE, and initiate far-reaching Legislative plans of our own.

We must stop hiding in the woods. We must become visible, and active in our communities, and be recognized as business leaders. But, before we can do that, we must appear BELIEVABLE.

We must kick off our muddy boots!

Exchange our tee shirts for dress shirts! And, trade in our blue jeans for "Botony 500" business suits! Finally, and most importantly, we MUST DEVELOP COMMUNICATION SKILLS!

About three years ago, I attended a lecture given by the President of a small Michigan college. His name was Father Leonard Chrobot. In his address to the Polish Cultural Society of Indiana, he stated: "If you don't like the way things are in the world today and you want to change them, get a good education, develop verbal and writing communications skills, learn how to use them, and you can move mountains."

It is INDEED a time to move mountains. We must restore this Profession to the dignity and the status that it once had.

I am confident that, with enough will, enough determination, enough personal commitment, and the Grace of God, we can. Thank you.



Charles Budnick
President



NEW ADDRESS

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IMPORTANT DATES TO REMEMBER

May 1-2, 1981

Spring Workshop, Indiana Society of Professional Land Surveyors, Purdue University, West Lafayette, Indiana.
Topic: Retracement Workshop to be conducted by the Bureau of Land Management.

August 9-18, 1981

International Congress of Surveyors, F.I.G., Montreux, Switzerland.

September 8-12, 1981

ACSM-ASP Fall Convention, San Francisco Hilton, San Francisco, California.

PRESIDENT'S REMARKS AT 1981 CONVENTION BOARD OF DIRECTOR'S APPRECIATION DINNER

T.S. Eliot once wrote: "Between the idea and the reality, falls the shadow."

Tonight I would like to paraphrase that by saying that: "Between the election and the completion of the term lies the work."

For some of us, the completion of the term and the work is just around the corner; but for those of us returning next year, the work is not complete — it is just beginning.

For those who are leaving, this Society and this profession will be forever indebted for your contribution.

For those of us who are staying, we must recognize the fact that if this profession is going to survive the decade of the eighties, that it will take a New and a much Firmer commitment, if we are to bridge that shadow — between the idea and the reality.

C.A. Budnick, President
I.S.P.L.S. 1980

PRESIDENT'S REMARKS AT 1981 CONVENTION BANQUET

Although I still have two months left to serve, I would like to take this opportunity to publicly thank all of you who helped make this a year of records:

Record Membership
Record Committee Participation
Record Committee Achievements
— and —

Record Convention Attendance

Two years ago when I became the President-elect of this Society I put the following heading on a legal pad: "ISPLS Presidential Preparation — 1979". Then I began to fill that pad with notes, ideas, goals, and dreams.

This afternoon while preparing for the business meeting, I found that pad and I read it for the first time since last February. I couldn't believe my eyes, for everything I had put on that pad has been, or soon will be, accomplished. Even more surprising are the words that I had written on the top of the first page: "Great things have been effected by a few men well conducted." — George Rogers Clark, 1779.

It couldn't be said any better — Thank you, and enjoy the evening.

C.A. Budnick, President
I.S.P.L.S. 1980

"1980 PRESIDENTIAL AWARDS"

President Budnick presented 12 members with "Distinguished Service Awards" at the 1981 Convention. These Awards were made for outstanding committee contributions, and achievements during the President's term of office. The Award recipients were:

Bob Bigelow - Convention
Ken Curtis - Library
Wes Day - Standards
Art Haase - Education
Jake Hall - Legislation
Dean Hamilton - Education
Orwic Johnson - Membership
Larry Manning - Membership
Jerry Martin - Education
Al McConahay - ByLaws
Dallas Montgomery - Education
Dave Wahlstrom - Education

President Budnick also presented Peggy Archer with a "Special Recognition Award" for her dedicated and faithful service.

The highlight of the Award presentation ceremonies was the President's announcement of the establishment of a Special Award to be presented annually for the next ten years (1980-1989). This Award, called the "Bridge Award" is given to someone who exemplifies the spirit and philosophy of the poem "The Bridge" - by Will Allen Dromgoole. The first Bridge Award (1980) was presented to John V. Schneider for: "Distinguished and benevolent service in the bridging of this Decade; for the betterment of the Society, the Profession, and the Future of Mankind." (See front cover)

STANDARD SURVEYOR LOCATION REPORT APPROVED BY ISPLS

On the next two pages is the final copy of the location report as adopted by I.S.P.L.S. on January 29, 1981, and approved by the Title Underwriters of Indiana, Inc. on March 20, 1981.

The report (which is valid for mortgage inspections throughout Indiana) can be used by the membership starting immediately. To achieve implementation, it is suggested that each practitioner incorporate the copy and format into his own system.

If there are any questions or suggestions as to implementation and usage, or any difficulty with an institution or agency in accepting this form, please forward this information to:

Mr. Wes Day
Standards Committee
I.S.P.L.S.
8714 East 21st Street
Indianapolis, IN 46219

It is only through practitioner feedback that ISPLS can determine whether or not the Standard is doing the job that was intended.

... We are indebted to the North Dakota Society of Professional Land Surveyors' newsletter, The 49th Parallel, for the following idea:

OBITUARY — IN MEMORY OF SOMEONE ELSE

We were saddened to learn this week of the death of one of the Indiana Society of Professional Land Surveyors most valuable members, Someone Else. Someone's passing created a vacancy that will be difficult to fill. Else has been with us for many years. Someone did far more than a normal person's share of work. Whenever leadership was mentioned, this wonderful person was looked to for inspiration as well as results. "Someone Else can work with that group". Whenever there was a job to do, a committee to chair, or meeting to attend, one name was on everyone's list — "let Someone Else do it."

Someone Else was a wonderful person — sometimes appearing superhuman, but a person can do only so much. Were the truth known, everyone expected too much of Someone Else. Now Someone Else is gone. We wonder what we are going to do. Someone Else left a wonderful example to follow, but who is going to follow it? Who is going to do the things Someone Else did?

When you have a chance to participate in your Indiana Society of Professional Land Surveyors — remember — we can't depend on Someone Else anymore.

SURVEYOR LOCATION REPORT
Minimum Requirements
as of January 29, 1981

Surveyor Location Reports are to be executed by an Indiana Registered Land Surveyor. THEY ARE FOR USE ON ONE TO FOUR FAMILY RESIDENTIAL TRACTS, not exceeding six acres in size. The instructions for this report are as follows:

The accuracy of location for this report shall be plus or minus one foot on tracts in platted subdivisions and plus or minus two feet on other tracts, unless otherwise specified and explained on the drawing.

CORNER MARKERS WILL NOT BE SET.

The report shall show the record description, if any, and conform with it.

The drawing shall show the following:

1. Location, dimensions, and description of all buildings or other permanent structures.
SHOW THEIR LOCATION BY THE SHORTEST DIMENSION TO EXTERIOR BOUNDARIES, OR ADJACENT EASEMENT LINES. No location data is shown relative to Flood Hazard Boundary Maps or solar easements.
2. The approximate location of any walls, fences, hedges, etc., that appear to mark lines of possession appurtenant to subject real estate that are farther from the title lines than the distance specified as the accuracy limitation herein or on the drawing. However, the existence or non-existence of any such visible lines of possession will in all cases be noted by a statement such as, "The rear yard has a (Description) on the (Direction)" or "There are no visible lines of possession".
3. The existence and extent of any encroachments, including any possible encroachments that may be indicated by location dimensions that are less than the stated limits of accuracy herein, on to the property or any easements shown on the property, or the abutting property by buildings or other permanent structures, including driveways (with driveway width shown), shall be specially noted.
4. Any evidence of possible common or joint use of driveways, but do not label driveways as "Common" or "Joint".
5. Any visible physical evidence of use which lies outside non-platted easements of record, (if copies of such record documents are provided for the surveyor) or platted easements.
6. Lakes, open ditches, streams or rivers, BUT EXCLUDING TILE DRAINS, on or abutting on the premises being inspected. Show locations by dimension only when the buildings or permanent structures are 75 feet or less from the top of the bank of ditches, streams or rivers which are possible legal drains.
7. Roads, streets, or alleys on or abutting the boundaries of the inspected property, with any known width, right-of-way lines, name, and location clearly indicated.
8. Any non-platted record easements or setback lines (if copies of such record documents are provided for the surveyor) or any platted easements and setback lines. BUT EXCLUDING THOSE CREATED BY ZONING ORDINANCE. Show the recording data for such items not created by plat.
9. The drawing scale; a north arrow; date of certification; surveyors signature, address, seal, job number, and company name; any names provided to the surveyor of: owner or buyers; mortgagee; title company and any associated reference numbers; and, property address.
10. Certification or recertification date within 30 days of submission.
11. Any exception to these requirements.
12. The minimum acceptable Surveyor's Certificate is shown on page one. The content and format of page one shall be as shown, but the type size and spacing may be altered to suit so long as the finished form is neat and clearly legible. The sheet size for the reports shall be no less than 8 1/2 inches by 11 inches and no greater than 8 1/2 inches by 14 inches. The surveyors name, address and phone number may be shown at the top or bottom margin if desired.

SURVEYOR LOCATION REPORT

THIS REPORT IS BASED ON LIMITED ACCURACY DATA AND THEREFORE NO DATA HEREIN SHOULD BE USED FOR CONSTRUCTION OR ESTABLISHING BOUNDARY OR FENCE LINES.

PROPERTY ADDRESS:

PROPERTY DESCRIPTION:

DESIGNATED PARTIES

MORTGAGEE
OR ASSIGNEES:
TITLE CO.:
OTHER:

REFERENCE NO.

REFERENCE NO.

I, the undersigned, an Indiana Registered Land Surveyor, hereby certify that on the date shown, I supervised the inspection of the real estate described herein at the Address indicated. THIS LOCATION REPORT WAS PREPARED FOR USE BY THE DESIGNATED PARTIES ONLY AND FOR NO ONE ELSE. THE ACCURACY OF THE LOCATION DATA SHOWN IS LIMITED TO THAT REQUIRED BY THE INDIANA "SURVEYOR LOCATION REPORT" MINIMUM REQUIREMENTS UNLESS OTHERWISE SPECIFIED AND EXPLAINED ON THIS DOCUMENT. IF A MORE ACCURATE OR DETAILED LAND SURVEY IS DESIRED OR IF CORNER MONUMENTS ARE REQUIRED, AN INDIANA LAND TITLE SURVEY SHOULD BE ORDERED.

I further certify that to the best of my knowledge this Location Report conforms with the SURVEYOR LOCATION REPORT Minimum Requirements, as adopted by the Indiana Society of Professional Land Surveyors, Inc., on January 29, 1981, and approved by the Title Underwriters of Indiana, Inc., on March 20, 1981.

CERTIFICATION DATE

SURVEYORS SIGNATURE _____

SURVEYORS JOB NO.

SEAL

29th ANNUAL CONVENTION COMMITTEES

The Convention Committee was under the chairmanship of Robert Bigelow. His committee was composed of Emil Beeg, Jud Rouch, and Donald Bengel. A tremendous job, well done!

These are the people to thank for all of their efforts in bringing together this fine Convention. ISPLS is grateful to their Northwest Indiana Chapter.

Speakers

Dave Pilz, Chairman
Don Bengel
Rich Hudson

Exhibitors

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Rita Brockman
Jeff Meyerrose
Todd Beers
Wilbur Peak

Promotion

Ordell Gertsmeier

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Bob Bigelow, Chairman
Bill Arden
Don Plumb

Transportation

Don Cochran

Entertainment

Chester Ziemniak

Ladies Program

Judy Bigelow
Marilyn Gertsmeier
Mary Alice Klein
Nancy Beeg
Eileen Plumb

NEWS NOTES

...During the 1974 Summer Workshops which were sponsored by ISPLS around Indiana, Professor John McEntyre prepared and distributed a 20-page paper "Retracement and Perpetuation of Corners in Indiana."

It was essentially a supplement to ISPLS Manual #1, The Perpetuation of Corners in Indiana (1972). Copies of the paper are available free from ISPLS headquarters office as long as the supply lasts.

...Over 150 books and manuals on surveying and related areas are presently on hand at ISPLS headquarters and are being processed, cataloged, and shelved to form a much needed library. Most of the books have been purchased, but some have been donated by members from their personal collections. Donations are encouraged and will be reported in the newsletter. The next issue of the HOOSIER SURVEYOR will contain a complete listing of all books and the approved ISPLS loan policy.

...Jud Rouch of West Lafayette conducted a two-day Workshop for North Dakota land surveyors in Bismarck on January 7-8, 1981. His topic was surveying instrumentation, curves, and traversing computations. "The Jud Rouch Workshop" was well received and he would welcome the opportunity to present the workshop to other groups.

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David K. Wolf Associates, Inc.
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PHOTOSTORY COVERAGE OF ISPLS ANNUAL CONVENTION IN MERRILLVILLE JANUARY 28-30, 1981

Photos by Plumb and Curtis



Bob Bigelow, right, and the Northwest Chapter of ISPLS did an excellent job in the planning and execution. Peggy Archer was in charge of the registration desk.



Over 175 surveyors registered for the 2½ day meeting in the beautiful Merrillville Holiday Inn.



Edwin Brownell, president of ACSM, addressed the assembly at the Thursday luncheon.



Many opportunities were available to renew friendships and/or discuss appropriate surveying matters such as this one with Dankert, Budnick, Curtis, and Condre.



Many familiar faces in the crowd!



Workshop leaders were (left to right) Jean Rose (communications), John Kyle and Gregory Franta (Solar Easements), and David Wahlstrom (Back to Basics). Attendees were able to attend two of the three offered.



William Daily of Indiana Attorney General's office discussed the Indiana-Kentucky Boundary.



Ken Curtis, Ray Tappan, and James Stem (NGS) discussed the 1983 Datum Adjustment and the New State Plane Coordinate System.



Richard Buckingham spoke on Surveying Control for Chicago's Deep Tunnel Project.



Some more faces in the crowd!



At the Friday evening banquet, Bob Bigelow, left, and his Convention Committee were recognized for an outstanding meeting. David Wolf, right, was introduced as the new ISPLS president (beginning April 1, 1981).



The 37 women joined their husbands for the closing Friday evening banquet and dance. Several members were recognized by ISPLS President Chuck Budnick.



The annual society business meeting was conducted by President Budnick with assistance from Pres.-Elect Wolf and Secretary Beeg. Committee reports were given by several chairmen including Wes Day, Roger Woodfill, Jim Dankert, and Jake Hall.



Prof. Morton J. Marcus of Indiana University's School of Business gave a very entertaining and thought-provoking talk on Indiana's economy.



Secretary Peggy Archer was given a gift by Pres. Budnick for outstanding performance for the Society.



Past-president John Schneider is presented the first annual "Bridge Award" for outstanding service to surveying profession and ISPLS.



That handsome guy in the Army uniform is Dean Hamilton!



After dinner, several couples enjoyed dancing.

Candid pictures of some of those attending the Friday evening closing banquet. Can you identify everyone?



Exhibit space was completely sold out (27 exhibitors) and attracted a lot of attention especially when the opening cocktail party Wednesday evening was held in the exhibit area. Jud Rouch and his Exhibits Committee did a great job.



Interim Guidelines for "As-Built Surveys"

SPECIFICATIONS FOR AS-BUILT SURVEYS

By Gunther Greulich, PE, RLS

FOREWORD: Vast numbers of structures of public works have been built since the creation of the United States. Local, State, and Federal Government, each has added to the maze of highways, pipelines, and cables covering the landscape. The burgeoning rise of private development and industry has added to the inventory of publicly used structures at an enormous rate. Sooner or later, most of privately built civil engineering works are turned over to public control. All of them affect America's health, safety and welfare. Their public use makes them everybody's concern.

Because design changes made during construction are seldom recorded, the exact location of underground utilities is often unknown. Surface structures are frequently built in other than the design location. In a 1974 state-of-the-art report, the American Public Works Association has found that less than 25% of all municipal records on utility location are complete and up-to-date. There is only one practical and cost-effective remedy — as-built surveys.

As-built surveys are also known under the name of post-construction surveys. They are needed to establish an accurate record of constructed civil engineering works. The purpose of the survey is to determine the horizontal and vertical position of structural detail. The results of the survey are being displayed on an as-built plan at an appropriate scale. The scale must be large enough to allow distinctions between elevations of tops and bottoms of structures, such as retaining walls and curbs, and may range from 1:100 to 1:1000.

Among structures usually requiring as-built surveys are:

- Airports
- Bridges
- Buildings
- Culverts
- Electrical Conduits
- Gas Connections to Individual Lots
- Gas Mains
- Local Sewerage Disposal Systems (Septic Tanks and Leaching Pipes)
- Oil Pipe Lines
- Parking Lots with Related Utilities
- Pole Lines
- Railroad Facilities
- Sanitary Sewers
- Storm Sewers (Drains)
- Streets and Highways

Telegraph and Telephone Cables
Underground Steam Lines
Water Connections to Individual Lots
Water Mains

It is particularly important that as-built positions of underground structures be located and determined prior to the back-filling of trenches.

In order to make acquired data compatible with other information that the community or agency may have on file, all horizontal data should be referred and tied to the local State Plane Coordinate System. All vertical information should be referred to the official local datum. All local datums in turn should be tied to the National Geodetic Vertical Datum of 1929.

The actual measuring and location must be done under the supervision of a registered or licensed land surveyor. Past experience has shown that contractors, laborers, and foremen are not qualified to adequately tie down structures that are to be back-filled.

TECHNICAL STANDARDS:

The following technical standards for as-built surveys and drawings are recommended:

1.0 Measurements

- 1.1 Measurements shall be taken to a precision compatible with the construction tolerances.
- 1.2 Measurements shall be recorded and shown on the plan or report to a number of significant figures representative of the precision of the work.

2.0 Monuments

- 2.1 Construction layout monuments and benchmarks shall be of a type and character and set in a manner providing a degree of permanency consistent with the terrain, physical features and intended use.
- 2.2 Sufficient monuments and offset information shall be provided to enable the user to check the accuracy of any points or lines established therefrom.
- 2.3 Monuments and benchmarks shall be witnessed in a manner that shall be easily discoverable by the user.

3.0 Field Notes

- 3.1 All pertinent information, measurements and observations made in the field during the course of the survey shall be recorded in an appropriate field note form and in a manner that is intelligible to another surveyor.

- 3.2 Field notes must be certified by the land surveyor or surveying engineer in charge.

4.0 As-Built Plan

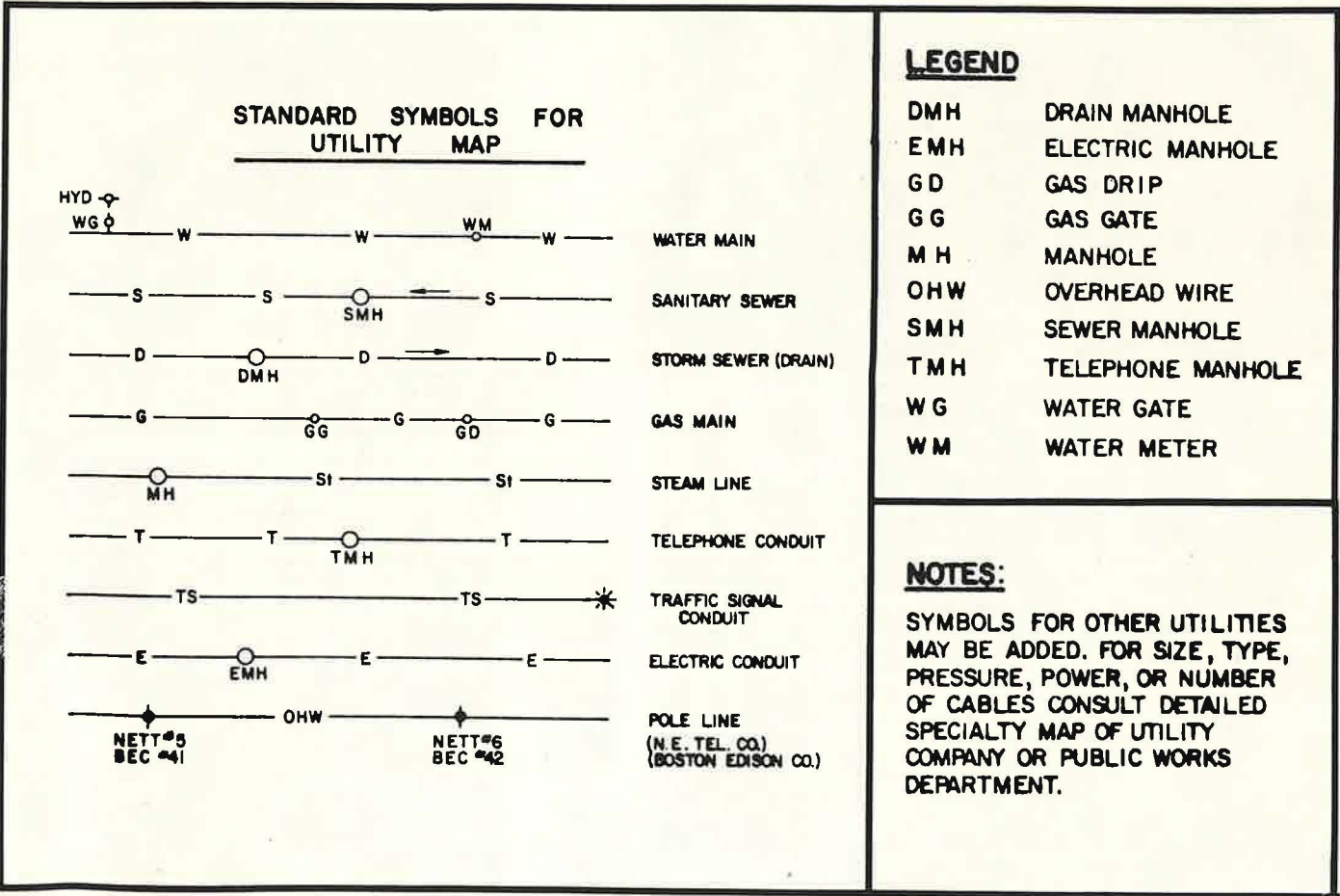
- 4.1 The client's name, the date of field work, the surveyor's file number, the name and address of the surveyor responsible for the work.
- 4.2 A location description of the project referenced to title description and political subdivision, or geographic location and, when appropriate, the specific description of the constructed facility surveyed.
- 4.3 Horizontal and vertical position of as-built structures. Underground facilities to be depicted as shown in Figure 1.
- 4.4 Identification of the horizontal and vertical datums on which the layout is based and specific description of the monuments used shall be noted.
- 4.5 North arrow and scale should be included.
- 4.6 A minimum of two permanent benchmarks per construction site shall be shown on the as-built plan.
- 4.7 All pertinent monuments identified as to character, with a notation whether found or set. Origin of found monuments shall be shown. When there is no available reference, this should be so stated.

- 4.8 Sufficient information for all layout control lines and points to allow the easy retracement of the work shall be included.
- 4.9 Any discrepancies or inconsistencies between the design documents and the as-built structure surveyed shall be noted.
- 4.10 Index and cross reference when the presentation consists of more than a single document shall be included.
- 4.11 As-built plans shall be certified by the land surveyor or surveying engineer responsible for the survey, bearing his seal and signature, as follows: "I hereby certify that all surface structures and underground utilities shown have been located in the field and reflect their true as-built position."

RECOMMENDATION:

The Alaska earthquake, the 1978 Great Blizzard in New England, and other natural disasters have demonstrated the need to know the exact locations of our lifelines of civilization. There is a certain urgency to the problem. A key valve shut off in time may save human lives.

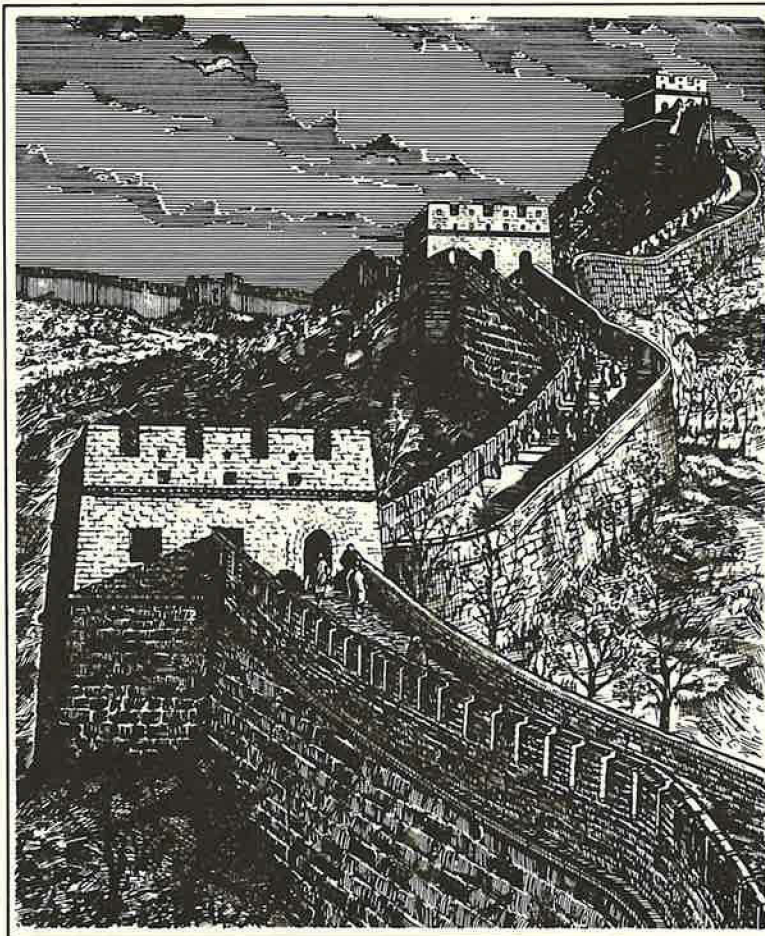
It is recommended that local public works departments and plant facility engineers require as-built surveys for all new structures within their jurisdiction and that they maintain an up-to-date file of as-built plans.



Backsights on Surveying

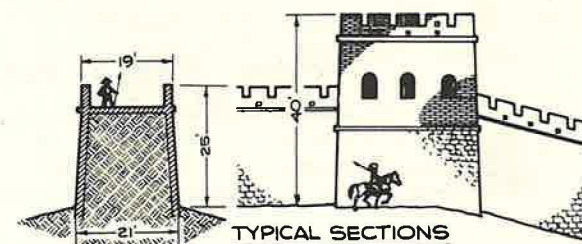
万里长城

THE GREAT WALL OF CHINA

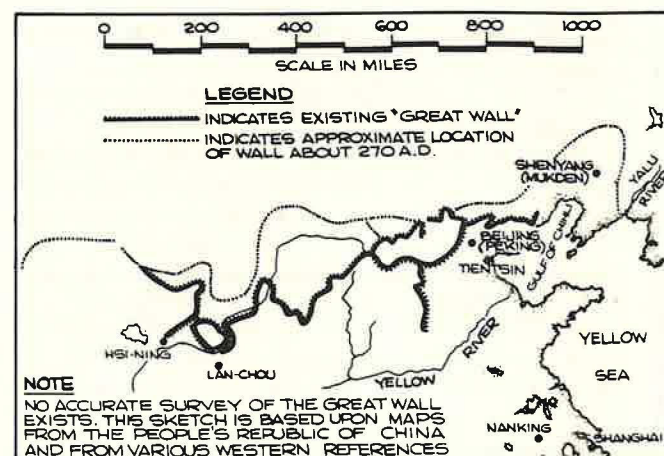


FROM AN ORIGIN SHROUDED IN MYTH AND LEGEND, CHINA'S RECORDED HISTORY SPANS 4000 YEARS. CONSTRUCTION ON THE "GREAT WALL" BEGAN DURING THE PERIOD OF THE WARRING STATES (476-221 B.C.). WHEN THE NORTHERNMOST KINGDOMS EACH BUILT WALLS AROUND THEIR CITY-STATE FOR PROTECTION FROM EACH OTHER AND AGAINST INCURSIONS BY THE NOMADIC PEOPLES OF THE FAR NORTH, ANCESTORS OF THE TURKS, MANCHUS AND MONGOLS. WHEN THE "SIX STATES" WERE UNIFIED IN 221 B.C., SHIH HUANG TI, FIRST EMPEROR OF THE CH'IN (QIN) DYNASTY, PUT 300,000 MEN (MANY OF THEM POLITICAL PRISONERS) TO WORK CONNECTING THE SEGMENTS INTO ONE HUGE RAMPART OF STONE AND EARTH WHICH WAS NAMED "WAN LI CH'ANG CH'ENG" (THE WALL OF 10,000 LI).

SUCCESSIVE DYNASTIES MAINTAINED AND REINFORCED THE WALL FOR 16 CENTURIES UNTIL 1368 WHEN THE MING DEPOSED THE MONGOLS. THE MING DYNASTY SAW A MASSIVE ONE HUNDRED-YEAR-LONG CONSTRUCTION PROJECT TRANSFORM THE 2,000 MILE LONG STONE AND EARTH RAMPART INTO A REAL FORTIFICATION STRETCHING WESTWARD FROM THE YALU RIVER TO JIAYUGUAN DEEP IN CENTRAL ASIA. CONSTRUCTION, BASICALLY, CONSISTS OF COMPACTED EARTH BETWEEN PARALLEL STONE AND BRICK WALLS WITH A STONE-PAVED ROADWAY ON TOP. THE SECTION AT PA-TA-LING PASS, TYPICAL OF THE "GREAT WALL", MEASURES AN AVERAGE 21 FT. WIDE AT THE BASE, 19 FT. WIDE AT THE TOP AND 25 FT. HIGH. 40 FT. HIGH STONE WATCHTOWERS AT APPROXIMATE 460 FT. INTERVALS, SERVED AS BARRACKS FOR UP TO 100 SOLDIERS AND WERE USED FOR SIGNALLING WITH SMOKE BY DAY AND FIRE BY NIGHT.



OLD RECORDS INDICATE THAT THE WIDTH OF THE ROADWAY WAS ESTABLISHED TO ACCOMMODATE "SIX HORSES RUNNING AHEAD", HOWEVER, THE 45 DEGREE INCLINES, STEPPED SECTIONS, ABRUPT TURNS AND MAN-SIZE DOORWAYS INTO THE WATCHTOWERS WOULD APPEAR TO HAVE PRECLUDED THE PRACTICAL USE OF HORSES ON THE "GREAT WALL".

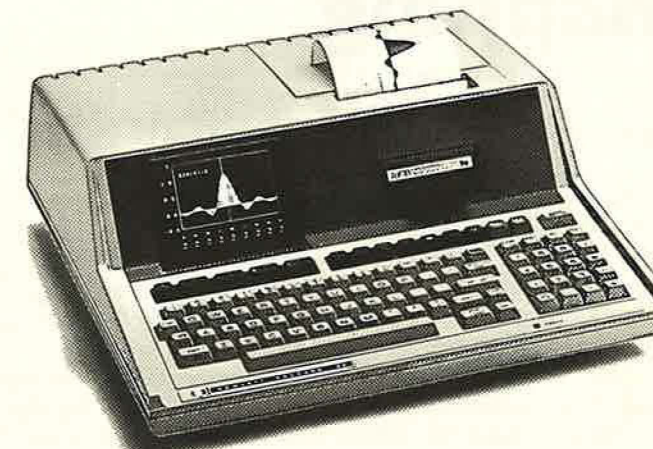


NOTE: NO ACCURATE SURVEY OF THE GREAT WALL EXISTS. THIS SKETCH IS BASED UPON MAPS FROM THE PEOPLE'S REPUBLIC OF CHINA AND FROM VARIOUS WESTERN REFERENCES.

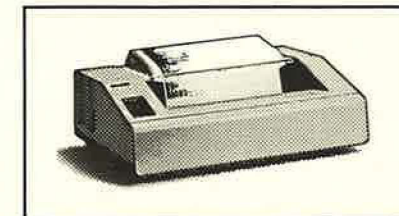
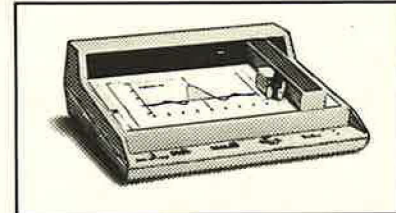
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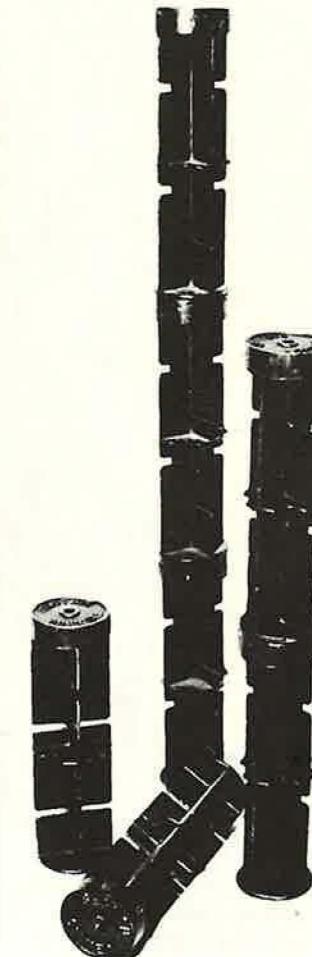
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An Integrated Approach To Large Scale Mapping

Combining the best of photogrammetry and interactive graphics

Permission to reprint this article was granted by Computer Graphics World where it originally appeared in the February 1981 issue.

By Bruce A Meyer
Synercom Technology, Inc.

The craft of map making is an ancient one whose techniques have gone through continuous evolutionary development as the need for accuracy and technical applications have become increasingly stringent. Modern technology has brought two powerful tools to the map maker in the form of the photogrammetric stereoplotter and the interactive computer graphics system. For the first time, these two tools have been combined in a totally integrated fashion in behalf of Mid-States Engineering Co., Inc.

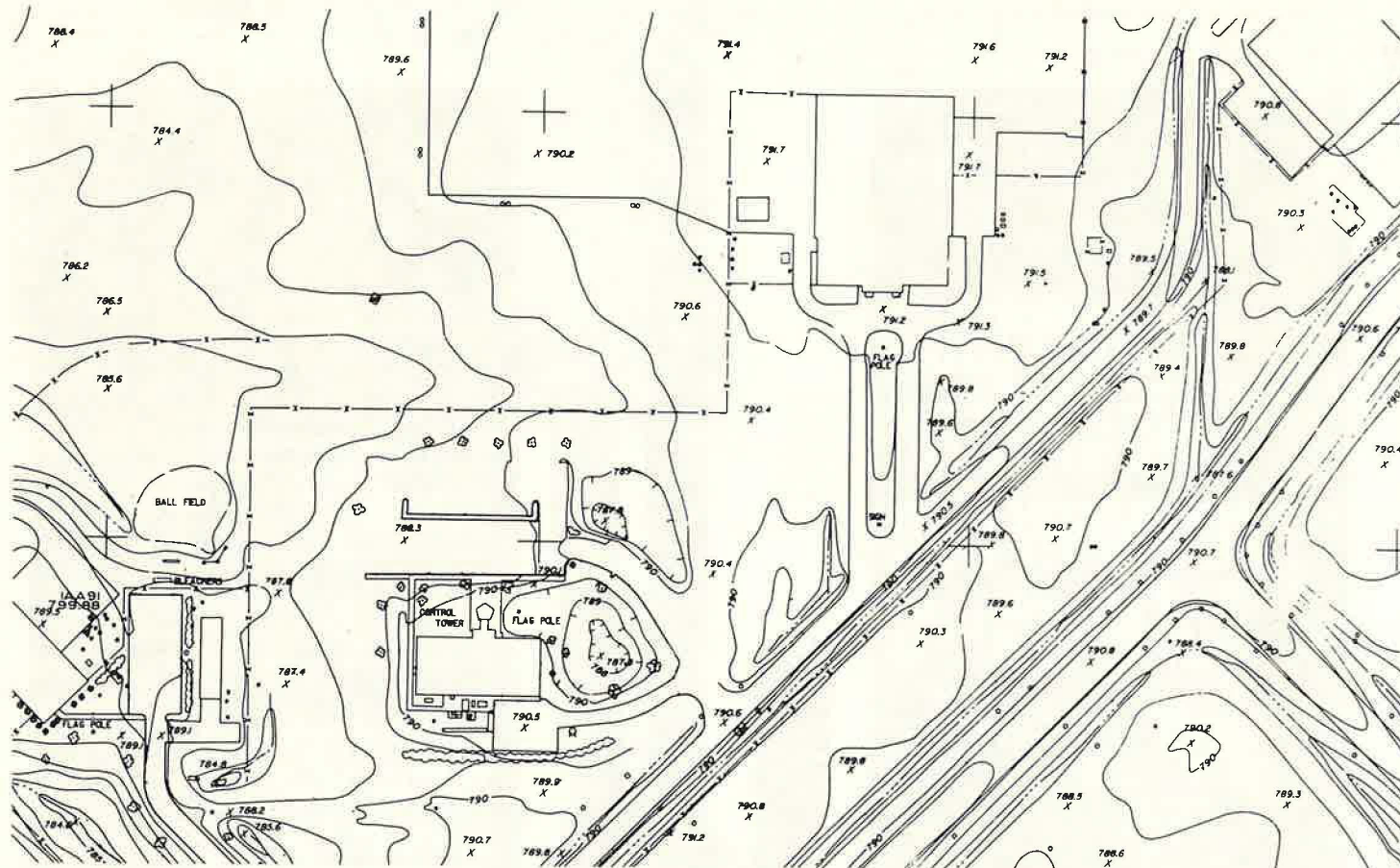
Mid-States Engineering is an Indianapolis-based consulting engineering firm engaged in site planning and design, land surveying and photogrammetric engineering. Mid-States Director of Projects Planning, Glenn Montgomery, points out that this "is the first installation of its kind in the United States. The total system provides a uniquely integrated photogrammetric/digital data base mapping capability, and adds a new dimension of productivity to the industry."

This innovative development is the

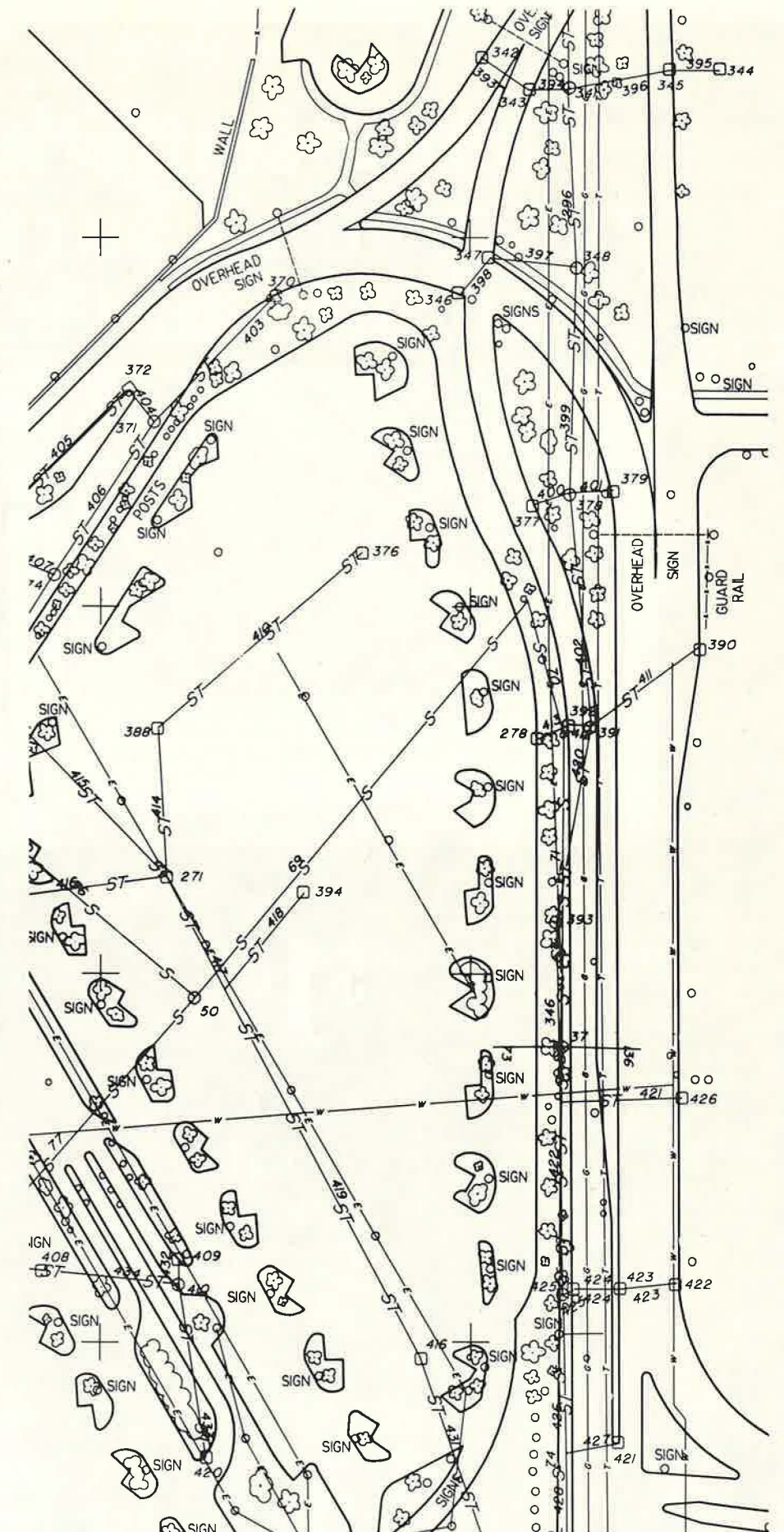
product of an international joint venture between Synercom Technology, Inc. and Wild Heerbrugg, Ltd. Synercom Technology is the developer of the INFORMAP system of interactive mapping and geographic data base management located in Sugar Land, a suburb of Houston, Texas. Wild Heerbrugg is a Swiss manufacturer of high precision photogrammetric and surveying instruments. The product is WILDMAP, which is an integrated software system that brings the interactive graphics and data base management capabilities of INFORMAP together with the stereoplotter. The system can be provided on a full turnkey basis or via retro-fitting encoders to integrate users' existing stereoplotters.

Mid-States was recently awarded a contract to provide a comprehensive urban drainage mapping program for the City of Indianapolis. The project called for mapping the total 402 square mile area at a 1" = 200' scale with two-foot contour intervals. A project of this size and complexity triggered Mid-States' interest in acquiring the automated system. Mid-States' President, Sol Miller, sees this project as eventually leading to the creation of a fully integrated city-wide digital data base for Indianapolis. Maps will feature:

- Indiana State Plane
- Coordinate System ticks, lines and values
- Roads and trails
- Power lines
- Buildings
- Canals
- Ditches
- Open water areas
- Quarries

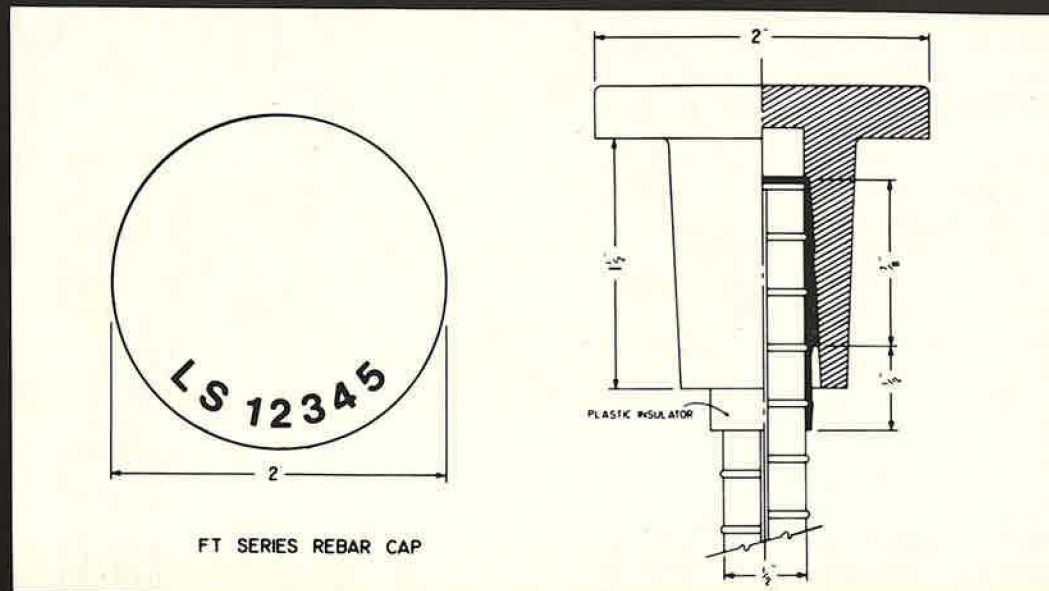


Digital plot at 1" = 100' scale produced by the INFORMAP system. The area corresponds to that of Figure 1. Features include 1' contour intervals, spot elevations and basic planimetric features such as building and runway outlines.



Digital plot at 1" = 50' of area outlined in Figure 3. Features include surface and subsurface utilities (water, sewer, gas, telephone, electric and FAA communications equipment) and planimetric features.

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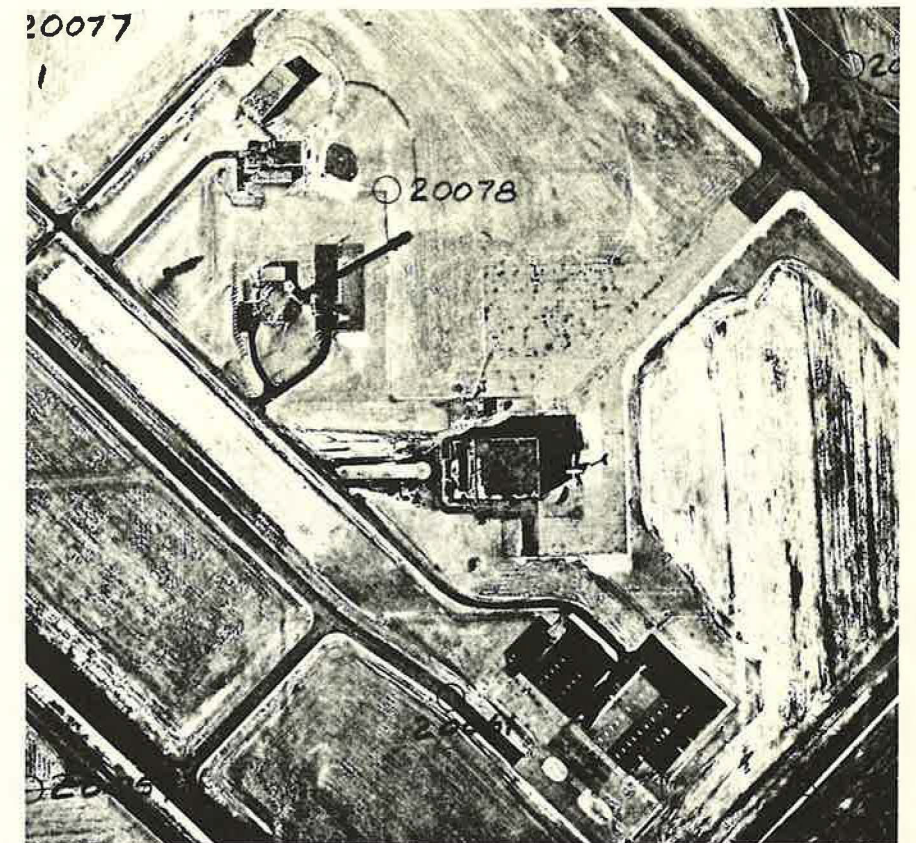
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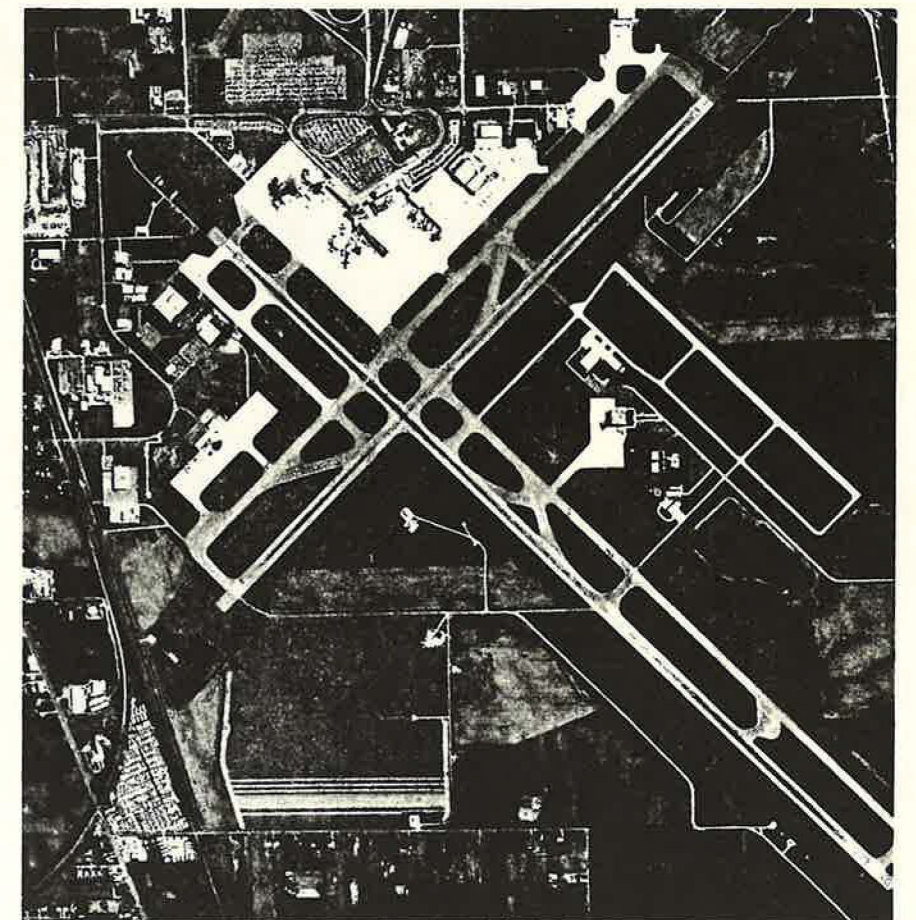
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Horizontal control points
Levees, spoil banks, and
embankments
Sundry annotation

To start the project, survey field crews marked and logged hundreds of ground control coordinate points preparatory to aerial photography. Precision aerial mapping photography produced a set of 1375 stereophoto pairs of the county. By conventional methods Mid-States teams began the painstaking work of registering the stereo photo pairs on the stereoplotter projection plates in absolute orientation. While looking through a binocular-like viewer, the operator sees the two photos as one three-dimensional image or stereo model. Projected into the stereo model he sees a "floating" black dot. Using known elevations and coordinates of the ground control points identified on the actual photographs, the operator arrives at a starting point that is of a specific elevation. By adjusting the instrument's controls, he can bring the two dots into convergence on that point of the stereo model. As long as the now single dot is projected on the stereo model surface at the specified elevation, the dots remain as one. If, however, he directs the dot over an area of greater or lesser elevation, the dots separate.

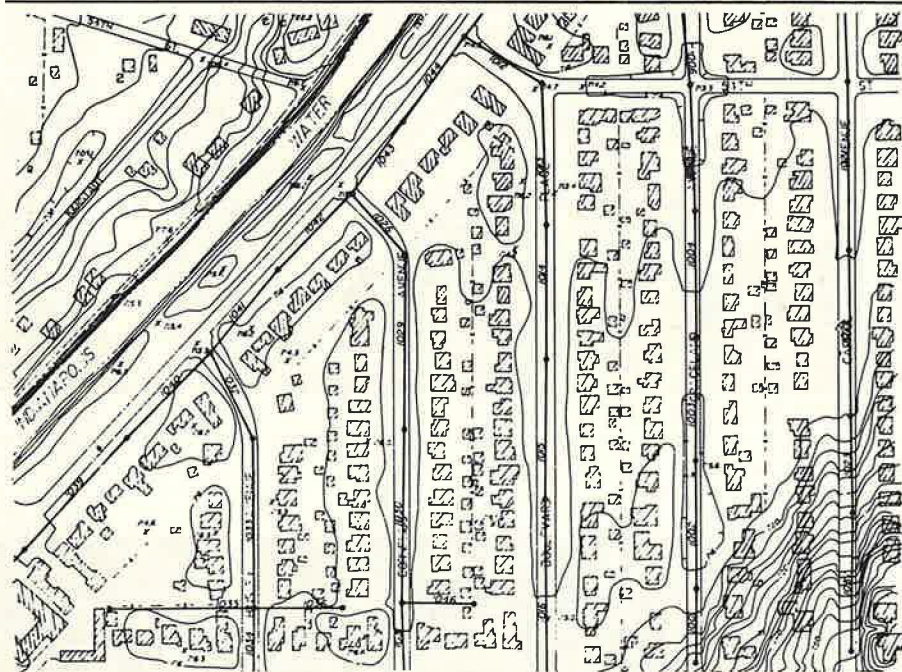


One of two aerial photos that make up a stereo pair used for photogrammetric digitization of the Indianapolis airport. Taken at 2800 feet altitude. Circles indicate vertical ground control points (Z-coordinates) and triangles indicate horizontal ground control points (X-Y).

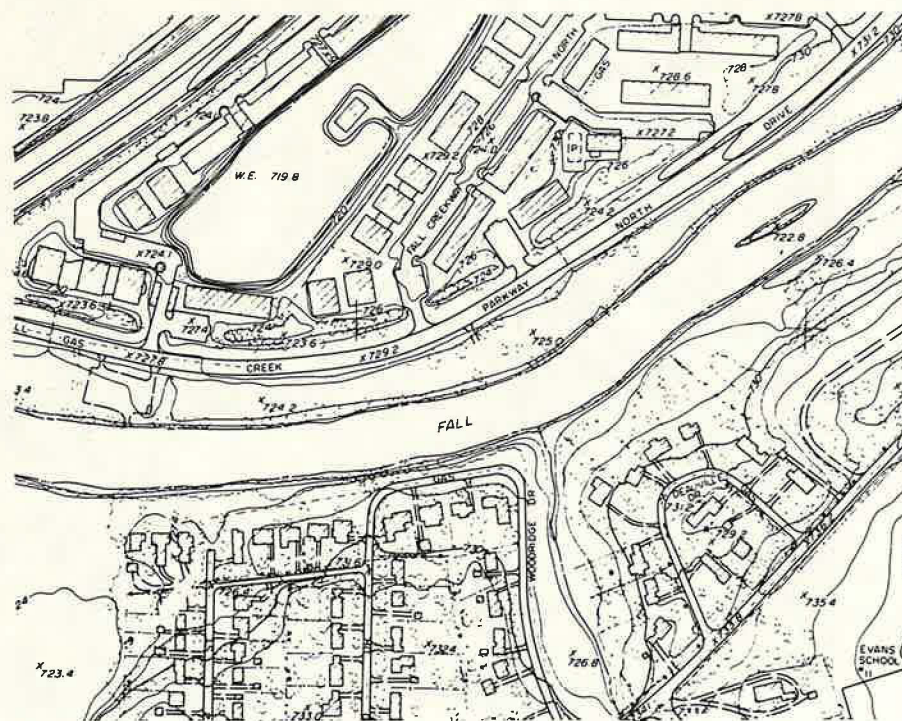


High-altitude overview of Indianapolis airport. Not part of a stereo pair.

"The system can be provided on a full turnkey basis or via retro-fitting encoders to integrate users' existing stereo plotters."



Sample sewer map plotted over drainage map base data as shown in Figure 6. Scale 1"=200'.



Sample drainage map produced by conventional methods. Scale 1"=200

A great deal of skill, concentration, and dexterity is required to manipulate the controls to cause the dot to trace a contour line through ravines and around out-croppings circumscribing a hill or paralleling a flood plain that is of one consistent elevation. Once that one contour line is complete, the operator resets the instrument to focus on a point two feet higher in elevation and repeats the process for the next contour line. To enter buildings, roads, and other map features, the dot must trace the image's outline in the stereo model.

While the operator has his attention focused on the stereo model, a mechanically coordinated device produces a pencil manuscript at a previously defined scale. This manuscript is a hard copy record of the course of the meandering black dot. A significant amount of additional operator time is required to correct errors, distinguish line types, square building corners, enter annotation, and apply symbols on the pencil manuscript. The manuscript is then scribed... another painstaking procedure in which a film negative is manually traced and cut. This scribed master, from which reprographic copies are made, is considered to be the final product. This master has a limiting scale range; is relatively inflexible; takes a considerable number of manhours for highly skilled technicians to produce; and has gone through successive manual operations within which errors can occasionally achieve a cascading effect. Wild Heerbrugg's and Synercom's recognition of these shortcomings led to the joint effort which produced WILDMAP.

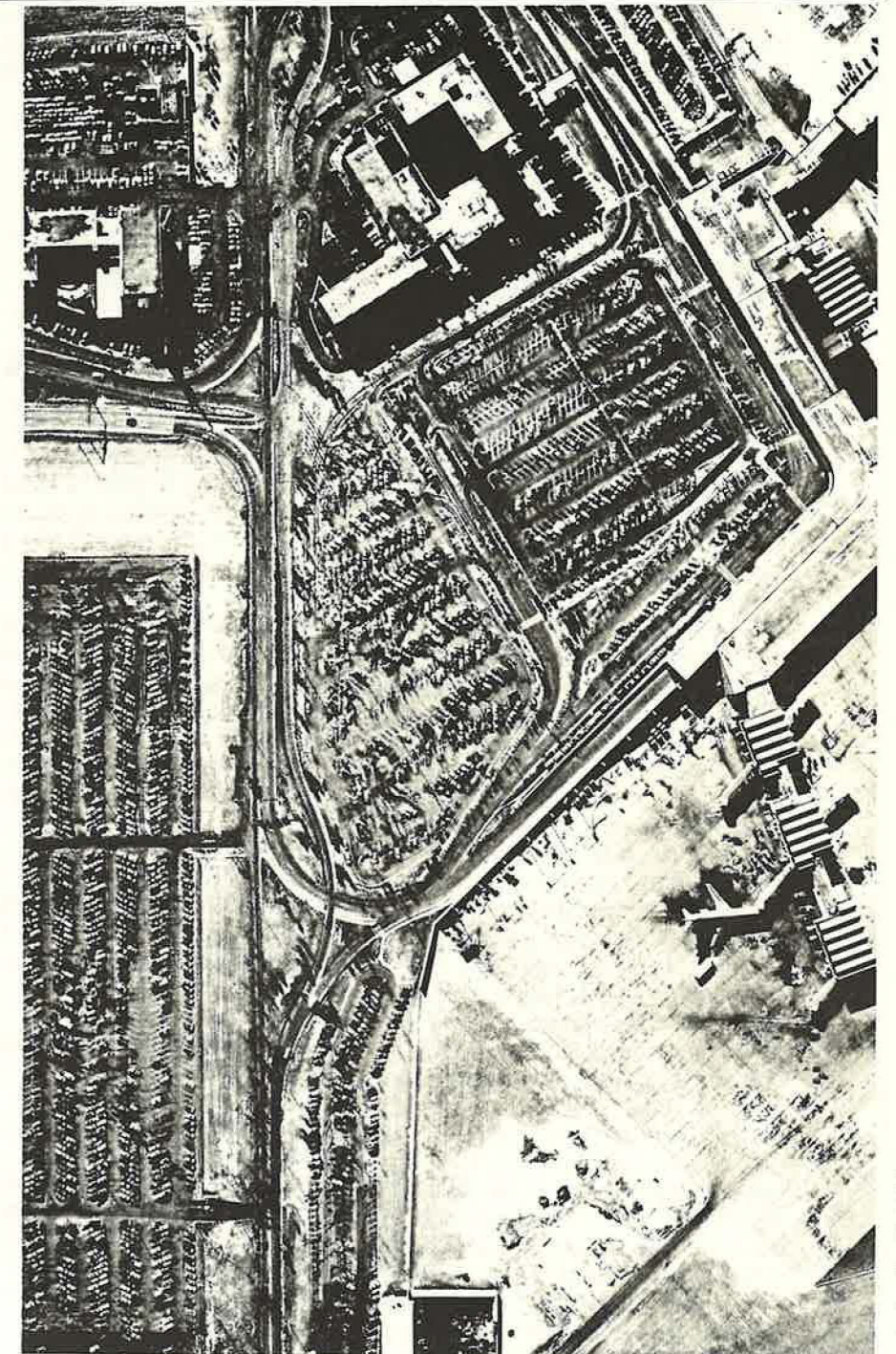
To implement the WILDMAP system, Mid-States Engineering acquired a Synercom INFORMAP system with the WILDMAP software

module. Their two Santoni IIC stereo-plotters were retro-fitted by Wild technicians with digital encoders and linked to the central processing system. CRTs stationed at each stereoplotter make the interface an interactive one. The encoders produce digital values relative to the known ground control coordinates of the stereo model. These X, Y and Z axes coordinates are shipped directly to the INFORMAP system. Accessing these coordinates enables the system to interactively assist the operator to establish the absolute orientation of the stereo model, by computing and displaying the instrument settings to be used. Conventional orientation techniques generally required about an hour to complete. The interactive process cuts this task time by 75 percent.

Schema definitions within the system allow the operator to identify specific data types as they are entered, such as fences, power lines, and other map features. So doing, enables the system to automatically assign line types and weights, along with other graphic distinctions that had previously been manually performed on the pencil manuscript. Errors can be interactively edited at a graphic CRT.

Finally, the scribed copy, capable of being produced by a properly equipped digital plotter, is no longer required. The system data base, accessed by selective retrieval routines, provides any combination of graphic elements for display or plotting at any desired scale. The three-dimensional data base can also be readily accessed as a resource for a variety of engineering applications... without affecting the permanent record. "Overall," reports Photogrammetry Liaison, Phil Worral, "the stereo compilation activity is completed in 45 to 65 percent less

"the stereo compilation...is completed in 45 to 65 percent less time and with fewer errors"



One of two aerial photos that make up a stereo pair of the same congested terminal area. Same altitude as Figure 1.

"Conventional orientation techniques generally require about an hour to complete. The interactive process cuts this time by 75 percent."

time and with fewer errors. But, the flexibility of the output overshadows everything else." Mid-States is currently using only about 20 percent of the WILDMAP capabilities.

Coordinated engineering activities performed on a common three-dimensional digital base map enable drainage programs, sewer systems, public utility networks, transportation systems, urban planning, land title plat mapping, tax mapping, and other municipal activities to be conducted in a coordinated and manageable fashion. "We have invested in this system with the expectation that municipal agencies will recognize this fact," points out Sol Miller. Bearing out his expectations, a new contract has just been awarded to Mid-States Engineering and HNTB for a complete sanitary sewer analysis and master facility plan for the City of Indianapolis. This joint venture for the Department of Public Works is funded in part by the Environmental Protection Agency, and will utilize the digital mapping capabilities of Mid-States to prepare a verified sewer map of more than four million linear feet of pipeline.

Mid-States recently completed a project for the Indianapolis Airport authority which compiled a digital map and facilities data base of the 6,000-acre Indianapolis International Airport. Flexible plot scaling enabled map sheets to be compiled at one scale for less dense areas and at larger scales for more congested areas. The project also called for the organization and entry to the data base of original design plans, existing utilities and other information as documented by several other engineering firms employed by the authority over the last 15 years. While the data base is maintained and kept up to date at the Mid-States office,

Airport Authority personnel will be able to access and utilize the information via a remote graphics station.

The overall effect of the WILDMAP/INFORMAP system has been to substantially improve the efficiency of the stereoplotting task, while creating a more useful and flexible product. The retro-fit capability of the system enables other photo-

grammetrists to optimize their equipment investments rather than requiring expensive instrument change-out. "Our system has generated a great deal of interest," cites Montgomery. "One of our biggest problems is satisfying everyone's interest in seeing a demonstration without interrupting our ongoing projects." ■

Glossary of Some Photogrammetry Terms

Stereo Plotter: (Stereoscopic plotting instrument) An instrument for plotting a map or obtaining spatial solutions by observation of stereoscopic models formed by stereo-pairs of photographs.

Stereoscopy: The science and art that deals with the use of binocular vision for observation of a pair of overlapping photographs or other perspective views, and with the methods by which such viewing is produced.

Stereoscopic Pair: (Photogrammetry) Two photographs of the same area taken from different camera stations so as to afford stereoscopic vision; frequently called a "stereopair."

Binocular Vision: Simultaneous vision with both eyes.

Stereoscopic Vision: The particular application of binocular vision which enables the observer to obtain the impression of depth, usually by means of two different perspectives of an object (as two photographs taken from different camera stations).

Stereoscopic Fusion: The mental process which combines two perspective views to give an impression of a three-dimensional model.

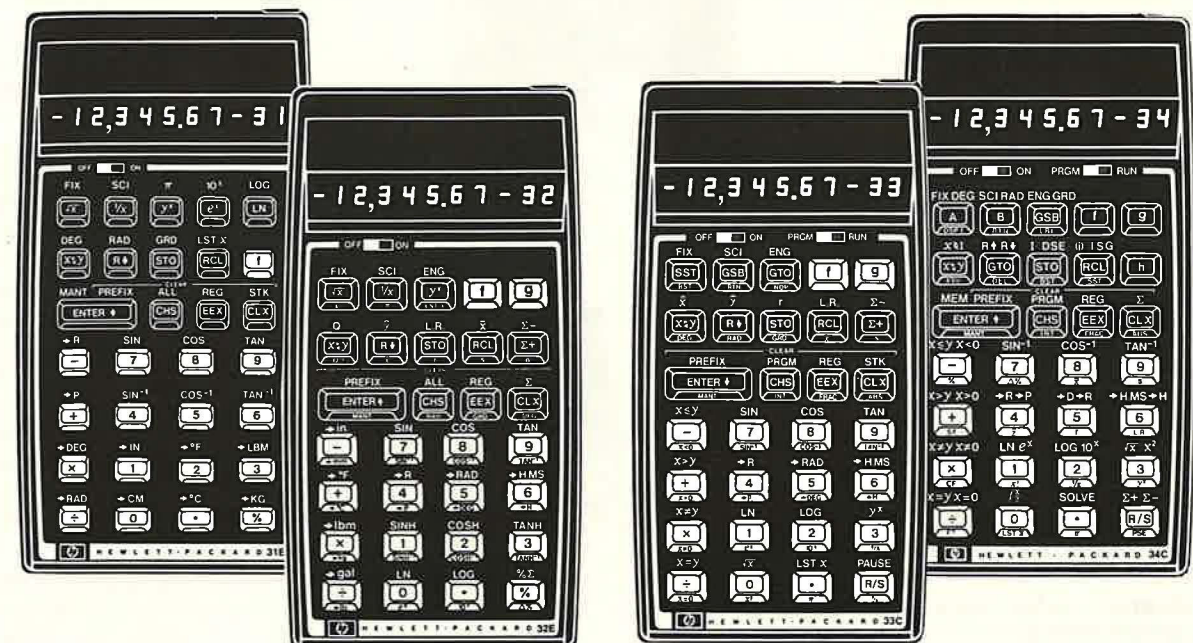
Stereoscopic Image: (Also called stereoscopic model or stereo-model) The mental impression of a three-dimensional model which results from viewing two overlapping perspective views.

Stereotriangulation: A triangulation procedure that uses a stereo plotter to obtain the successive orientations of the stereopairs of photographs into a continuous strip. The spatial solution for the extension of horizontal and/or vertical control using these strip (or flight) coordinates may be made by computational procedures.

Absolute Orientation: The scaling, leveling, and orientation to ground control (in a stereo plotter) of a relatively oriented stereoscopic model.

Relative Orientation: Determining (in a stereo plotter) the position and attitude of one pair of overlapping photographs with respect to the other photograph.

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A Word To The Wives

While much attention has been directed toward the professional development of the surveyor, hardly anyone ever considers the surveyor's wife. Now surveyors' wives are nearly as plentiful as surveyors themselves; but nowhere do I see in our seminars or conventions, topics presented such as "Geodesy for Young Brides" or "Matrons' Guide to Construction Staking."

Here, Ladies, I am going to rectify this oversight and bring you into the mainstream of the surveying profession.

First, you must learn that there are many more people who **know** all about surveying than there are who do all the surveying. For instance, just the other day a client of mine who raises cattle was telling me all about how he had set his section line fence using a U.S. Government bench mark. For the ladies not yet in the know, a bench mark measures elevation above sea level and is not a boundary location—a fact not known by my cattleman friend.

Now, to introduce you into surveying, you should learn some of the special terms used by surveyors. I will first give you the surveying term and then what it means or how it is commonly used:

CHAIN—A long thin steel measuring tape marked off in feet used to pull rear chainmen down the road with.

REAR CHAINMAN—A usually shapeless, inert, heavy weight attached to the end of a chain to keep it tight.

PLUMB BOB—A heavy weight attached to the rear chainman to keep him vertical.

HATCHET—A device for splitting stakes, driving splinters into your hand. Also for tenderizing your thumb; a very painful process on a cold morning.

A SIGHT—How you see your husband after a night out.

DOUBLE-CENTERED—What your husband sees after a night out.

A REDHEAD—What made your husband see double-centered on his night out.

TRANSIT—An instrument used by the party chief to locate girls sunbathing in the nude.

30 FSPLS Journal



Author Unknown

Obviously, I could go on forever, but I am sure with just this basic vocabulary you can quickly pick up a large part of your hubby's shop talk—and guess the rest.

Now that you have some idea of the terminology you are better equipped to understand the various branches in which your surveyor practices.

First, there is cadastral surveying, derived from the French word "cadastre," meaning scaffold or place of public burning of martyrs. This martyr process creates much burned wood and charcoal which the early surveyors disposed of by throwing it in a hole and calling it a charcoal corner.

In surveying, a triangle is not having a girl friend as well as a wife, as you would suspect. Actually, it is a geometric figure which is used in triangulation, which is a form of measurement in which the surveyor tries very hard to end up with only three sides and 180° of angle. If he ends up with too many extra sides or too

many degrees of angle he usually renames it a traverse. You can plainly see that while most traverses start out to be straight lines, circumstances beyond the party chief's control, such as his survey crew, cause it to end up being sort of a zig-zag. Sometimes this works out for the best, especially if there is a tree or person standing in the way.

The professional surveyor's life is not all glamorous and glitter, no matter what it may seem like to you ladies. During the winter months the surveyor suffers from cold drafts when chainmen open and close the doors on his heated survey truck. In addition, he will often develop, concurrently, a bad case of laryngitis, from over-work on his vocal cords. Sometimes this will develop into pneumonia and the surveyor must stay at home. This complication is especially prevalent during World Series playoffs.

The surveyor's main irritation, however, is hoarded for his greatest irritant and affliction, affectionately known as "summer help" or "student trainees" or sometimes by other names less delicate, but infinitely more eloquent.

Whenever the devoted irritation of the summer helpers flags, the office engineer can be counted on to spur the surveyor on to new and greater furies. The new antagonist of the surveyor is given to unreasonable criticisms of unclosed traverses and undescribed survey monuments.

The surveyor's only weapon against this martinet's vicious slander is the use of a 9H pencil for drawing up his field notes. This is comparable to writing a letter and using a phonograph needle for a stylus and can be counted on to send the office engineer into apoplexy every time. This creates a solid feeling of warmth and good will within the surveyor throughout the day.

But these petty wars subside and summer soldiers return to school with the first crisp mornings of Fall, and if only for a short time, it is eminently worthwhile once again to be a land surveyor.

Reprinted from the
Cornerpost, Vermont.

September, 1980



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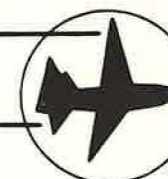
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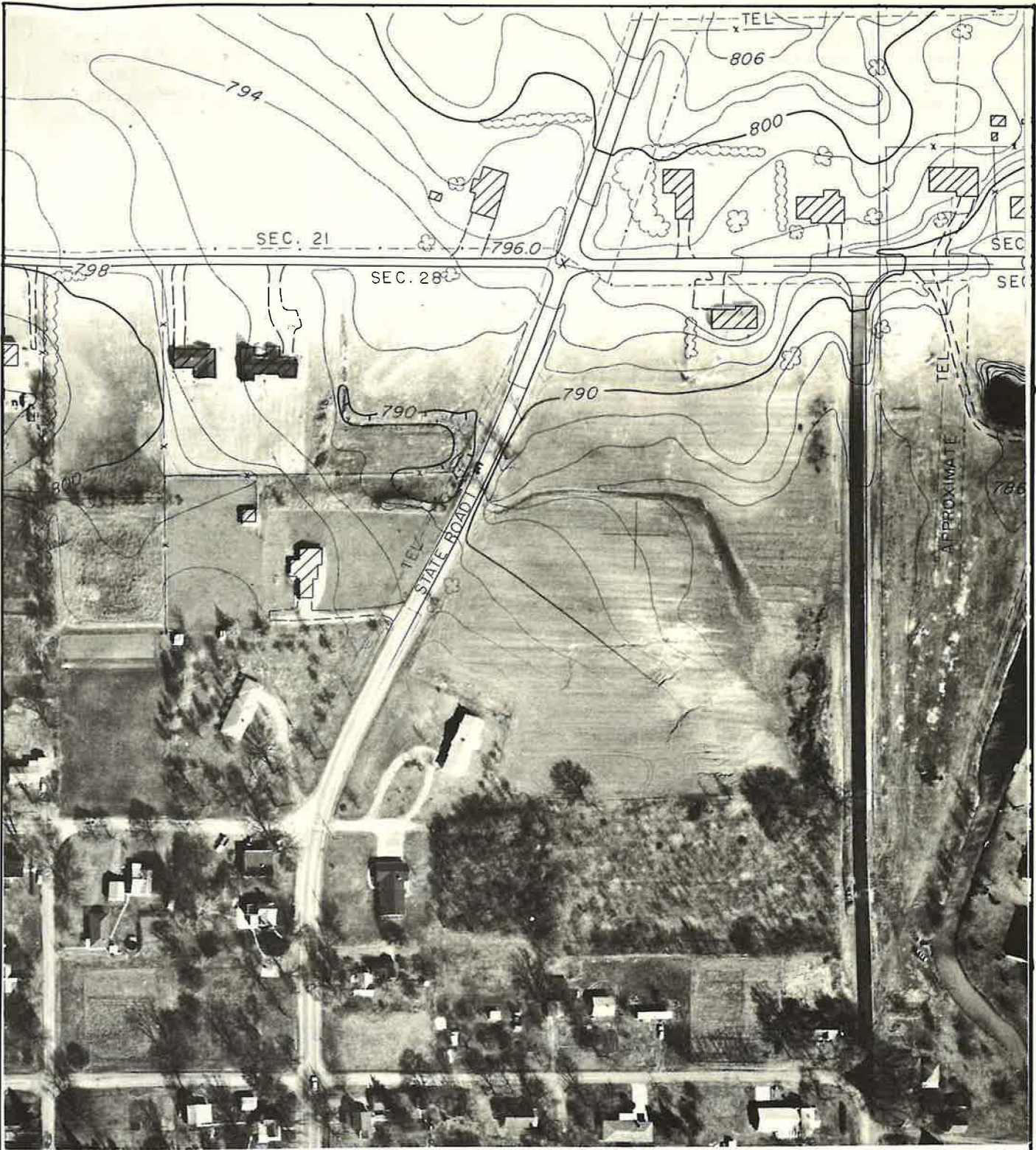
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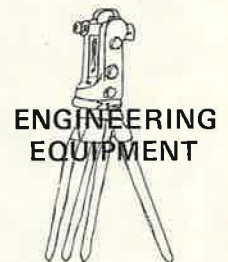
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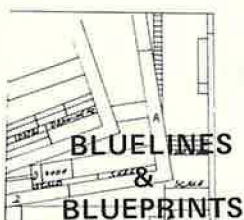
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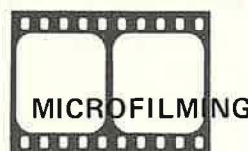
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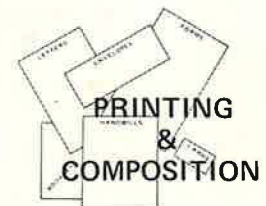
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