

**NSPS - ACSM
SURVEY TECHNICIAN CERTIFICATION**

**PROGRAM BOOK
AND
EXAM PREPARATION INFORMATION**



NATIONAL SOCIETY OF PROFESSIONAL SURVEYORS

AMERICAN CONGRESS ON SURVEYING AND MAPPING

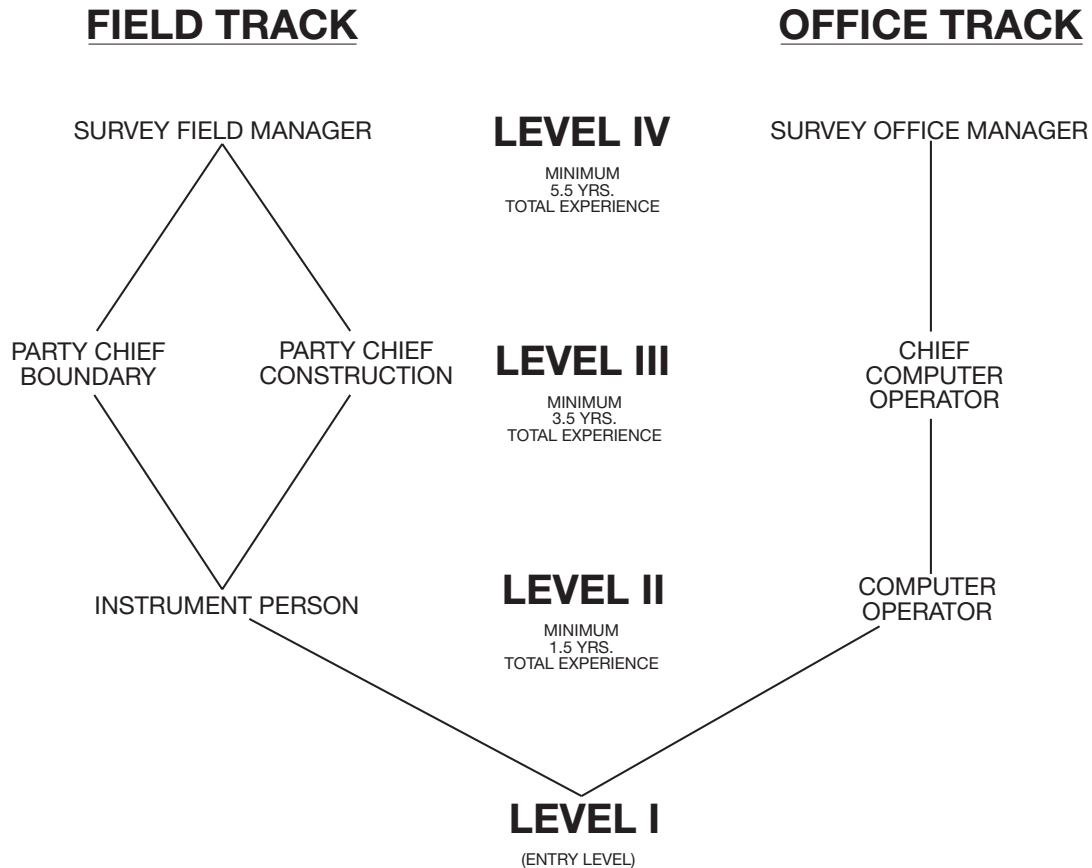
REVISED AUGUST 2001

NSPS - ACSM

SURVEY TECHNICIAN CERTIFICATION

ORGANIZATION CHART

TECHNICIAN CERTIFICATION PROGRAM



CERTIFICATION MAY BE SOUGHT IN EITHER THE FIELD TRACK
OR THE OFFICE TRACK OR IN BOTH TRACKS.

Detailed knowledge, skills & ability requirements are described under each position description
and further defined under each respective work element section.

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Level I: Level I Technicians are required to demonstrate knowledge of basic first aid skills and safety requirements. The individual in this position possesses a basic knowledge of field operations and types of surveys as well as familiarity with field equipment and procedures used in these functions. Additional skills required include computational ability, survey note taking, drafting/CAD and map reading. Work Elements further describe the requirements related to this position.	
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Level II: In addition to the Level I requirements, Level II Technicians are required to demonstrate more detailed knowledge of survey computations, types of surveys and field operations. The individual in this position is familiar with comprehensive field note taking, plan reading and preparation. The field track technician possesses a detailed working knowledge and application of standard field equipment. The office track technician possesses a detailed working knowledge and application of related computer hardware and software. The technician has a basic knowledge of the principles of the profession. Work Elements further describe the requirements related to this position.	
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Level III: In addition to the Levels I and II requirements, Level III Technicians are required to demonstrate a thorough knowledge of survey computations, types of surveys and field operations. The individual in this position is well versed with field note reduction and in depth plan interpretation and preparation. The Level III technician possesses supervisory skills and a detailed working knowledge of standard field and office procedures. The technician has knowledge of the principles of the profession and various technical standards. Work Elements further describe the requirements related to this position.	
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SURVEY TECHNICIAN CERTIFICATION PROGRAM

SUMMARY OF PROGRAM

The National Society of Professional Surveyors (NSPS), a member organization of the American Congress on Surveying and Mapping (ACSM), sponsors a comprehensive national certification program for survey technicians. The program is recognized by the U.S. Department of Labor as part of the National Apprenticeship Program. The Survey Technician Certification Board (STCB), which administers this program, recognizes the importance of technicians to the surveying and mapping profession.

As the Technician Certification Program Organization Chart shows, the program has four levels of certification (I through IV) and two main tracks (Field and Office). Certification is by examination and experience. The certification program was initiated in 1986 and testing at Level I began in 1988. The fact sheet on the next page provides additional background information on the program.

The goals of the Survey Technician Certification Program are:

- Recognize the important contribution that technicians provide to the surveying and mapping profession.
- Provide credentials to technicians.
- Identify those who have achieved specific technical competencies.
- Provide a career ladder for technicians.
- Provide firms who support and utilize certified technicians, a way to evaluate applicants and an opportunity to promote the fact that their technical staff is certified.

REQUESTS FOR CERTIFICATION INFORMATION

All requests for certification information must be directed to NSPS in writing. In this manner better records of requests and payments can be kept.

Note: The NSPS-ACSM Survey Technician Certification Program is looking for ideas, suggestions and questions.

Program information can be obtained from the ACSM web site at <http://www.acsm.net>, from the ACSM Fax-On-Demand system at 240/632-9716 or by e-mail: cstinfo@acsm.net

Please Send to:

NSPS - Survey Tech.
6 Montgomery Village Avenue, Suite #403
Gaithersburg, MD 20879-3557

CERTIFICATION VALUE

Certification as a survey technician is official recognition by NSPS-ACSM that a person has demonstrated that he or she is minimally competent to perform surveying tasks at a specified technical level. Certification provides the individual with a sense of achievement, since it reflects advancement in the field of surveying. Certification also provides employers with a method of determining job assignments and advancement since certification is an indication of one's ability to perform specific job tasks.

LEGAL ASPECTS

Certification does not license individuals to practice surveying. Professional survey licensing is regulated by state boards of registration. This program is sponsored by NSPS-ACSM and should not be confused with any other certification program.

SURVEY TECHNICIAN ORGANIZATIONS

Survey technicians seeking technical development through publications and educational opportunities may want to consider joining NSPS, a member organization of ACSM. Educational programs, publications and other member services are provided by ACSM. Membership in NSPS-ACSM is not required for certification. Those interested in membership can obtain information by writing:

ACSM
6 Montgomery Village Avenue, Suite #403
Gaithersburg, MD 20879-3557
<http://www.acsm.net>

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SURVEY TECHNICIAN CERTIFICATION PROGRAM

FACT SHEET

What: A four-level certification program for surveying technicians throughout the United States. The program is being developed and implemented by a Certification Board established by the National Society of Professional Surveyors - American Congress on Surveying and Mapping. The program uses “work elements” to define the testing parameters. Minimum qualifications at each level are based on hours of experience.

Why:

- To give important and needed recognition to the survey technicians in public and private practice.
- To provide objectives for improvement and advancement for field and office survey technicians (particularly as four-year degree requirements become mandatory for licensure or registration).
- To give employers a way of judging the qualifications of potential employees.

How:

<p>All Levels:</p> <ul style="list-style-type: none"> • Application fee: Student Member none <li style="padding-left: 20px;">*Member \$30.00 <li style="padding-left: 20px;">Non-Member \$50.00 • Examination fee: Student Member \$110.00 <li style="padding-left: 20px;">*Member \$120.00 <li style="padding-left: 20px;">Non-Member \$150.00 • All fees are non-refundable. • Open book exams. • Examination review request; in writing within 60 days of notification of test results. • Certificate suitable for framing. • Annual renewal of certification: \$25.00 fee. 2nd specialty: additional \$10 fee. Reinstatement fee \$10.00 • Group discount available for 10 or more examinees. Call 240/632-9716 for details. 	<p>Levels I Through III:</p> <ul style="list-style-type: none"> • Quarterly testing nationwide. • Examinations from two to seven hours in length. • Multiple choice questions, machine graded. • Cycle review determines passing score. • If failed, no reapplication necessary (within 1 year period), just examination fee for retesting. <p>Level II and III:</p> <ul style="list-style-type: none"> • Second “specialty” exam fee additional \$50. <p>Level IV:</p> <ul style="list-style-type: none"> • Offered Cycle I–Applications are due on Dec. 15. • “Take Home” exam format. • Two months to complete. • Essay/Report form. • Pass/Fail grade.
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* **A member is a NSPS dues-paying individual or an employee of an ACSM sustaining member.**

The information contained in this booklet is general in nature. Specific information relating to testing fees, policies, and procedures will be included in the confirmation package, which is mailed upon acceptance of the application.

Questions Most Often Asked:

- Is membership in ACSM required? No.
- Is membership in ACSM possible? Yes.
- Can one start testing/certification at any level? Yes, except for Level IV, as long as one satisfies the work experience criteria for that level. **For Level IV you MUST have an active Level III certification.**
- Can one certify in all categories (FIELD: boundary, construction and OFFICE) available in a level? Yes, if one satisfies the experience and testing requirements.
- How is this program related to licensure and licensure exams? It isn’t. This is a technician level program, not a professional level program.
- What type of calculator, computer or data collector is allowed at the examination? Programmable calculators are allowed if they are : silent, without external power or communication links and without “QWERTY” style keyboard.

TESTING POLICIES

Based on pre-testing, examinations will be designed so that a minimally competent individual will answer 70% or more of the questions correctly. The normal passing score for the survey technician examination will be 70%, however the Board shall have the right to modify the cut-off score for any exam based upon the exam analysis furnished by the testing agent. The Board will periodically review test results and adjust the passing score if necessary.

In the event that it becomes necessary to postpone the examination date, the examination can be rescheduled for the next test date at the same location. The first postponement will be made at no cost, however, subsequent postponements are subject to additional fees. The adjusted fees will be equal to 1-1/2 times the original examination fees. A postponement request will be accepted until the date specified. Non-payment of exam fees will result in exam cancellation. A cancellation due to non-payment will require payment in full prior to rescheduling the examination.

In order to advance within the program, annual recertification must be kept active.

If applicant fails an examination, the application will be retained for one year after the test date. Applicants who re-test at the same level within that year will be assessed only the exam fee. If more than one year has passed or if applicant changes level, the applicant must update the application information and pay the application and exam fees. If an applicant fails the same examination in three consecutive attempts, formal and documentable proof of continuing education relating to the work elements failed is required before a fourth attempt will be scheduled. Or, whenever possible, applicants can step down a level.

The final scores of all examinations will be established by the Board. **Examination review will be made upon written request.** Requests must be received within 60 days of notification of the test results. Examination review will be conducted at NSPS headquarters.

Challenges of examination questions must be made on the day of examination on form(s) provided by test proctors. The Board reserves the right to be the final judge of all challenges and extenuating circumstances pertaining to examination scoring. **Any examination returned with missing pages will result in a failing grade.**

When an examinee chooses to include a specialty exam with a primary exam, certification will be awarded only upon successful completion of the primary exam. The primary exam consists of questions covering all of the work elements whereas the specialty exam consists of questions distributed within only one or two work elements. Therefore, certification will not be awarded if a passing score is achieved on the specialty exam and not the primary exam. The passing grade on the specialty exam will be held and honored for 5 years. Upon successful completion of the primary exam, both certificates will be awarded.

While Level IV requires a broad foundation of knowledge, the Survey Technician Certification Board feels that, due to the nature of the Level IV Exam, questions can be focused quite narrowly in only one or two areas. So to ensure the overall quality and consistency of the Technician Certification Program and to be certain that technicians are qualified in all of the specific work elements of their area, examinees for Level IV must first have successfully passed one of the Level III Exams (Party Chief Boundary, Party Chief Construction, Chief Computer Operator).

TESTING RESULTS

TESTS ARE GRADED ONCE PER CYCLE. YOU CAN EXPECT TEST RESULTS TO BE MAILED TO YOU ABOUT SIX WEEKS AFTER THE END OF THE CYCLE.

**CYCLE 1 RESULTS—MID MAY
CYCLE 2 RESULTS—MID AUGUST**

**CYCLE 3 RESULTS—MID OCTOBER
CYCLE 4 RESULTS—MID FEBRUARY**

REVIEW COURSE/INFORMATION FOR SURVEY TECHNICIAN EXAMINATION

To provide some guidance in preparing for an exam or a training session or seminar, the Survey Technician Certification Board offers the following:

- Presentation Outline for an Introductory Talk About the Program could be used along with a Fact Sheet
- Detailed List of the Contents of Work Elements, Typical Test Questions, and a Question Matrix for the Level I, II, and III Exams
- References by Topic

I. Self Study—The Importance of Preparing for the Exam

Be prepared: These tests require a significant amount of computations.

Test results over the last few years have shown that many examinees who had a good deal of experience and, in some cases, even formal surveying education did not pass an examination. The Technician Certification Exam sequence is a challenging, timed test. Perhaps the fact that it is an open book examination may tend to give examinees a false sense of security. You must be prepared to move purposefully through 2 to 7 hours of testing. Study, review, and practice in the Work Element areas is important to prepare you for the questions.

If you are planning to study for one of the exams on your own, you might start by taking some paper and listing all of the different topics listed in each of the Work Elements for your exam on a separate line along with the number of questions you will be asked in that Work Element. (See Examination Matrices attached.) This will give you a topical study guide to work with as well as how much weight is placed on each Work Element area. As you complete your studies in each topic, cross out or check off that line.

The number of questions on your exam will differ depending on which level you are taking and whether or not you have requested a second specialty examination.

Level I	= 200 questions	(4 hours to complete)
Level II	= 180 questions	(6 hours to complete)
2nd Specialty	= 60 questions	(7 hours to complete both tests)
Level III	= 150 questions	(6 hours to complete)
2nd Specialty	= 60 questions*	(7 hours to complete both tests)

* If the primary Level III exam is in the field track (Boundary or Construction), then a second specialty exam also in the field track (Construction or Boundary) will have only 30 questions (1 additional hour to complete both tests).

A 2nd specialty retest will be given a 2 hour completion time.

II. Review Course

Since most attendees of a training session will be interested in preparing themselves for only one of the three levels, instruction should be geared for that particular level. However, in the event that you wish to provide a general overview training for any and all levels, we recommend you gauge the amount of time you spend on each Work Element by the needs of the audience. Such a “general” training session should be clearly noted in any promotional material so that those who just want, for example, Level II training, realize the scope of the program.

Due to the fact that it would be impossible for the Survey Technician Certification Board (STCB) to attend and critique every planned training session, it should be clearly stated in promotional literature and handout material used in the training that while guidelines were provided by NSPS/STCB, the Board, while encouraging such training, has not endorsed this specific training program or instruction.

The sample presentation outline, fact sheet, lists of Work Elements, question matrices, references, and sample test questions, given in the following pages, are provided to help in preparing a review course for one or more of the exams.

The following is a suggested presentation outline for a one to four hour overview of the program that could be used at Chapter and State Society meetings:

A SAMPLE PRESENTATION OUTLINE

What is it all about and who is it for?

- A brief history of the program.
- Purpose of the program.
- Combination of job competency and testing.
- Levels I, II, III, and IV.
- Field/Office Route.
- Test dates, Location, and Cost.
- U.S. Department of Labor Registration.
- License/Registration versus Technician Certification.
- Seals and Stamps.
- Sample Test.
(A voluntary short sample test will be available to take, so bring your calculators.)

Any of this information can be duplicated, used as overheads, etc.

NSPS - ACSM
SURVEY TECHNICIAN CERTIFICATION
SAMPLE TEST
TO USE AT A PRESENTATION

TYPICAL TEST QUESTIONS

LEVEL I.

- Shock is:
 - Always life threatening
 - Not a serious problem
 - Can be life threatening
 - Failure of the circulation system to provide enough blood to all parts of the body
 - Only caused by lightning
- A map has a scale of 1 inch = 400 feet. 5.75 inches would represent how many feet:
 - 2300.00
 - 2228.00
 - 2304.00
 - 2100.00
 - 400.00
- The elevation at the top of a 10-inch concrete wall is 327.21 ft. A distance of 13 feet, $2\frac{3}{4}$ inches is measured to the base of the wall. What is the elevation of the base of the wall:
 - 313.981
 - 327.210
 - 327.981
 - 313.935
 - 312.981
- Running a level loop in surveying means you are finding which type of measurement:
 - Vertical
 - Horizontal
 - Slope
 - Angular
 - Theoretical
- Figure 1 is an example of what type of angle:
 - Vertical
 - Horizontal
 - Zenith
 - Deflection
 - Center

LEVEL II.

- If a distance of 215.21 feet is measured at a +21 degree slope, what is the horizontal distance:
 - 215.00
 - 215.21
 - 200.92
 - 201.92
 - 215.42
- For every ± 15 degrees Fahrenheit in temperature change, what is the error in a 100.00 ft. chain:
 - 0.01
 - 0.10
 - 0.02
 - 0.20
 - 0.00

3. The best way to treat bleeding is:
 - A) Direct pressure
 - B) Elevation
 - C) Pressure point
 - D) Tourniquet
 - E) None of the above

4. A traverse that was 2702.322 feet long had an error of .081 ft. What is the error of closure:
 - A) 1/5000
 - B) 1/15221
 - C) 1/32020
 - D) 1/33362
 - E) None of the above

5. The complementary angle to a positive vertical angle:
 - A) Horizontal
 - B) Nadir
 - C) Central
 - D) Oblique
 - E) Zenith

LEVEL III.

1. In leveling, FS's and BS's are balanced to minimize the following error(s):
 - A) Instrument error
 - B) Operator error
 - C) Rod error
 - D) Heat error
 - E) Wind error

2. Given the following circular curve data: PC 128+00, PT 138+00, 4 degree curve, the deflection angle for station 131+00 measured from the PC will be:
 - A) 1 degree 00 minutes
 - B) 1 degree 30 minutes
 - C) 3 degrees 00 minutes
 - D) 6 degrees 00 minutes
 - E) 12 degrees 00 minutes

3. An incorrect Internet address is:
 - A) dog.edu
 - B) cat.acm
 - C) mouse.gov
 - D) fish.net
 - E) bird.com

4. The distance between point A and point B in prolonging a line by double centering is 0.31 feet. Where should the prolonged point be set: (see figure 4)
 - A) A
 - B) B
 - C) .16 to right of B
 - D) .16 to the left of A
 - E) mid-way between A/B

5. In earth work calculations, what would the end area be of the section shown in Figure 5 (in square feet):

- A) 279.21
- B) 575.28
- C) 267.20
- D) 621.21
- E) 100.00

TYPICAL TEST ANSWERS

LEVEL I

- 1.) D
- 2.) A
- 3.) A
- 4.) A
- 5.) A

LEVEL II

- 1.) C
- 2.) A
- 3.) A
- 4.) D
- 5.) E

LEVEL III

- 1.) A
- 2.) D
- 3.) B
- 4.) E
- 5.) B

FIGURE 1

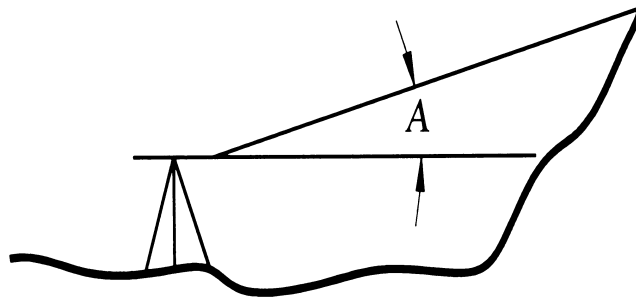


FIGURE 4

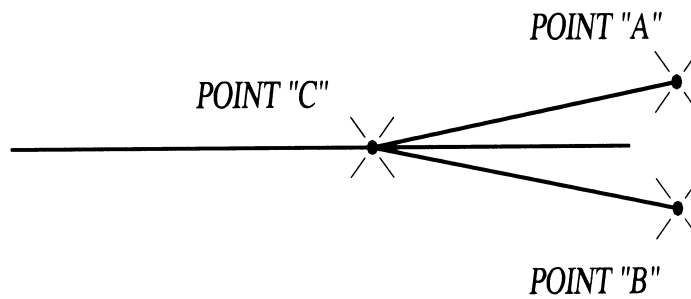
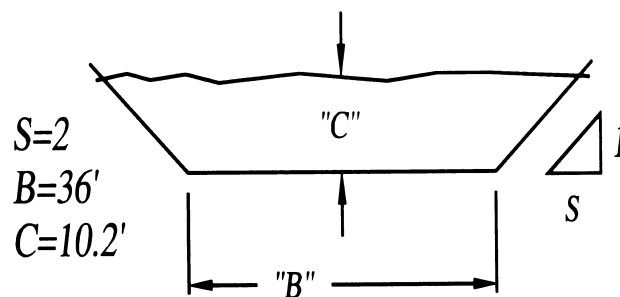


FIGURE 5



- 3.) Shock is:
 A.) Always life threatening B.) Not a serious problem C.) Can be life threatening
 D.) Failure of the circulation system to provide enough blood to vital organs E.) Only caused by lightning
- 4.) A burn that blisters is a:
 A.) 1st degree burn B.) 2nd degree burn C.) 3rd degree burn
 D.) 4th degree burn E.) 5th degree burn
- 5.) A map has a scale of 1 inch = 400 feet. 5.75 inches would represent how many feet:
 A.) 2300.00 B.) 2228.00 C.) 2304.00
 D.) 2100.00 E.) 400.00
- 6.) The symbol shown as used in contemporary mapping depicts: (see Figure 1 pg. 13)
 A.) Sewer lines B.) Water lines C.) Streams
 D.) Fence lines E.) Power lines
- 7.) A contour map with contours (see Figure 2 pg. 14) would be said to have a contour interval of:
 A.) 25 feet B.) 15 feet C.) 10 feet
 D.) 5 feet E.) 20 feet
- 8.) On a quadrangle map (see Figure 3, pg. 13) the symbol noted represents what type of object:
 A.) A school B.) An office building C.) A road
 D.) A mine E.) A church
- 9.) What is the perimeter of a square lot having an area of 2.52 acres:
 A.) 331.32 feet B.) 1325 feet C.) 80.32 rods
 D.) 20 chains E.) 1326 feet
- 10.) The elevation at the top of a 10 inch concrete wall is 327.21 ft. A distance of 13 feet, $2\frac{3}{4}$ inches is measured to the base of the wall. What is the elevation of the base of the wall:
 A.) 313.98 B.) 327.21 C.) 327.98
 D.) 313.95 E.) 312.98
- 11.) A reference map scale is shown on a map as 1 : 62,500. It can also be shown as 1" = _____ ft.
 A.) 5208.33 feet B.) 62,500 feet C.) 32,500 feet
 D.) 62,500 inches E.) 5,280 feet
- 12.) One acre contains :
 A.) 43,560 sq. ft. B.) 43,000 sq. ft. C.) 44,560 sq. ft.
 D.) 208 ft. sq. E.) 210 ft. sq.
- 13.) In survey practice which of the following measurements are used:
 A.) Horizontal B.) Vertical C.) Angular
 D.) All of the above E.) Theoretical
- 14.) Running a level loop in surveying means you are finding which type of measurement
 A.) Vertical B.) Horizontal C.) Slope
 D.) Angular E.) Theoretical
- 15.) If you forgot to record a survey measurement, you would have created what kind of error:
 A.) Too bad error B.) Systematic error C.) Compensating error
 D.) Blunder E.) Mechanical error
- 16.) In the United States, traditionally, a Gunter's chain is _____ long:
 A.) 1 meter B.) 66 feet C.) 150 feet
 D.) 20 meters E.) 16.5 feet
- 17.) The compass face on a transit which is pointing north has
 A.) East to the right of west B.) East to the left of west C.) No east or west marking
 D.) No marking whatsoever E.) Graduation to 1 minute of arc
- 18.) A permanent point with a known elevation is called
 A.) Triangulation point B.) Survey point C.) Temporary benchmark
 D.) Local survey point E.) Benchmark

- 19.) In a survey crew of two who is usually the notekeeper:
 A.) Party chief B.) Chain person C.) Drafter
 D.) Property owner E.) A or B
- 20.) A total station is a
 A.) Dumpy level B.) Digital theodolite C.) Self level
 D.) Transit E.) Distance measuring device
- 21.) Total station reflectors (prisms) can be used:
 A.) All by themselves B.) Interchangeably with any instrument C.) Only if calibrated with the instrument
 D.) To measure around corners E.) To gauge magnetic attraction
- 22.) In traversing, if you are asked to set a backsight, you probably would:
 A.) Go back to the truck for lunch B.) Take out the level and set it up
 C.) Use something to mark the instrument's sight-line D.) Use something to mark the level's sight-line
 E.) Clear brush from line
- 23.) Clearing a survey line means that you should:
 A.) Clear a space 10' wide B.) Clear a space 5' wide
 C.) Clear a space only as wide as needed D.) Clear a space 5' wide down to the ground
 E.) Bulldoze the line to be surveyed
- 24.) Figure 4, page 14 is a traverse showing what type of angle:
 A.) Clockwise B.) Counter clockwise C.) Deflection right
 D.) Deflection left E.) Clockwise and counter clockwise
- 25.) Figure 5, page 14 is an example of what type of angle:
 A.) Vertical B.) Horizontal C.) Zenith
 D.) Deflection E.) Center
- 26.) What does drafting media refer to:
 A.) The National Organization Printing Maps B.) The screen you are drawing on
 C.) The size of the paper your drawing is printed on D.) The TV news coverage on local channels
 E.) The type of material drawings are printed on
- 27.) Which of the following terms is not an old surveying term:
 A.) Rope stretcher B.) Gunter's chain C.) Surveyor's tape
 D.) Rod E.) Vara
- 28.) If you are pacing a distance of 3000 feet and your pace is equal to 2.6 feet, how many paces would you have to count to go the 3000 feet:
 A.) 1153.8 B.) 576.92 C.) 7800
 D.) 3000 E.) 2600

TYPICAL TEST ANSWERS

- | | | | |
|--------|--------|--------|--------|
| 1.) C | 2.) D | 3.) D | 4.) B |
| 5.) A | 6.) D | 7.) E | 8.) E |
| 9.) C | 10.) A | 11.) A | 12.) A |
| 13.) D | 14.) A | 15.) D | 16.) B |
| 17.) B | 18.) E | 19.) A | 20.) E |
| 21.) C | 22.) C | 23.) C | 24.) C |
| 25.) A | 26.) E | 27.) C | 28.) A |

FIGURE 1

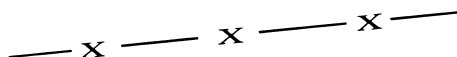


FIGURE 3

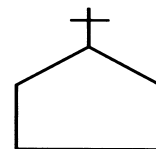


FIGURE 2

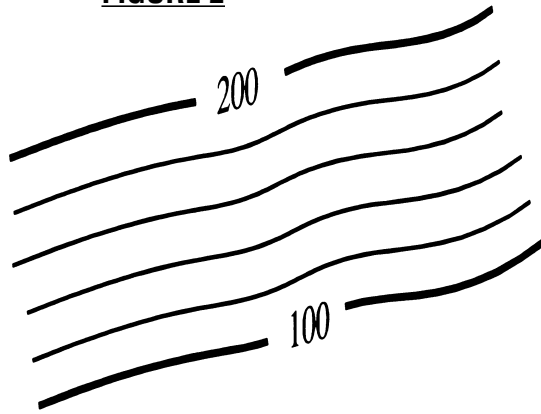


FIGURE 4

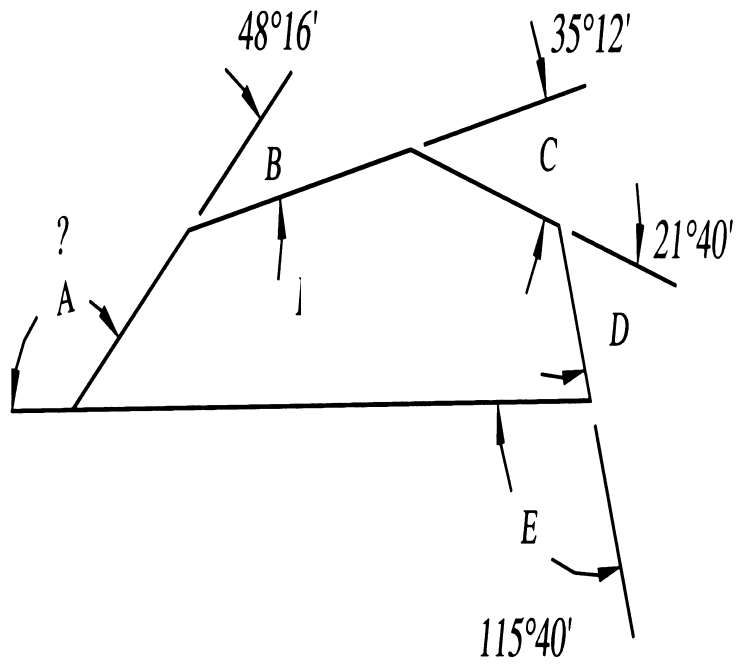
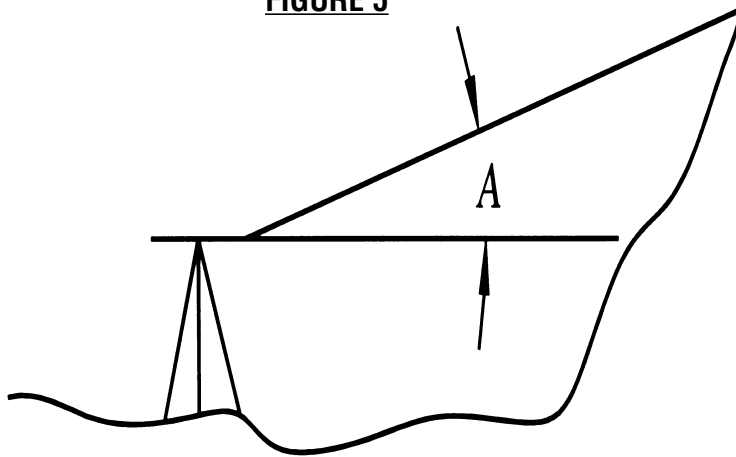


FIGURE 5



NSPS - ACSM
SURVEY TECHNICIAN CERTIFICATION PROGRAM
LEVEL I EXAMINATION MATRIX
NUMBER OF QUESTIONS PER WORK ELEMENT

Work Element

1) Types of Surveys	10
2) Field Equipment & Instruments	41
3) Survey Computations	50
4) Control Points: Horizontal & Vertical	6
5) Field Operations	21
6) Field Notes	5
7) Plan Reading	17
8) First Aid & Safety	20
9) Drafting/CAD	17
10) Electronic Instruments	8
11) Survey History	5
TOTAL QUESTIONS	<hr/> 200

LEVEL II QUALIFICATIONS

SPECIALTY AREAS

FIELD:

3,000 hours or 1.5 years

OFFICE:

3,000 hours or 1.5 years

(Of the 3,000 hours, 750 hours can be education) Classroom or correspondence studies will be counted toward the 750 hours provided a transcript is provided. The 750 hours constitute one year full time schooling based upon a minimum of 12 credit hours per semester or quarter. 1 CEU = 10 CLASSROOM HOURS = 0.5 CREDIT HOURS.

For those applicants who wish to test in additional specialties, experience must be documented in each specialty field.

LEVEL II

SURVEY TECHNICIAN CERTIFICATION

POSITION DESCRIPTION, WORK ELEMENTS AND TYPICAL QUESTIONS

POSITION DESCRIPTION

In addition to the Level I requirements, **Level II Technicians** are required to demonstrate more detailed knowledge of survey computations, types of surveys and field operations. The individual in this position is familiar with comprehensive field note taking, plan reading and preparation. The field track technician possesses a detailed working knowledge and application of standard field equipment. The office track technician possesses a detailed working knowledge and application of related computer hardware and software. The technician has a basic knowledge of the principles of the profession. Work Elements further describes the requirements related to this position.

WORK ELEMENTS

Test problems will be taken from the following work elements:

- 1) *Types of Surveys* (F=10; O=10)
Knowledge of the principles of performing basic surveys: leveling, traversing, triangulation, trilateration, public land surveys, metes and bounds surveys, construction surveys, photo control surveys, and GPS surveys.
- 2) *Field Equipment & Instruments* (F=35; O=15)
Knowledge of the care, cleaning, and use of a variety of surveying tools and equipment, including field radios. Knowledge of the operation, checking, and basic field adjustments on transits, theodolites, total stations, robotic total stations, data collectors, levels, compass, tribrachs, tripods, and GPS equipment. This would include repeating observations. Some historical knowledge is required.
- 3) *Survey Computations* (F=40; O=55)
Knowledge of trigonometry, geometry, algebra, coordinate geometry, and basic surveying computations. A familiarity with hand-held calculators and micro-computers is important. With either a hand-held calculator or micro-computer software, be able to enter field data and produce positional information (i.e. leveling, traversing, stadia, topographic mapping and construction stakeout). Demonstrate lot, area, and intersection (bearing-bearing, distance-distance, bearing-distance) computations. Knowledge of the reduction and checking of field notes for determination of positions and elevations. Have an elementary comprehension of computer operating systems and GIS.
- 4) *Control Points: Horizontal & Vertical* (F=10; O=10)
Know how to interpret control point records and data sheets, as well as locate points in the field.
- 5) *Field Operations* (F=35; O=10)
Under the supervision of a party chief, be able to coordinate field work for a variety of standard types of surveys. Know how to observe the Sun and Polaris for True North determination. Know basic sources of measurement errors. Know principles of staking and stake markings. Know procedures for GPS surveys.
- 6) *Field Notes* (F=10; O=10)
Know how to keep neat and orderly field notes for standard surveying operations: leveling, traversing, topographic mapping, layout, as-built surveys, boundary surveys, profile and cross-section surveys.
- 7) *Plan Reading & Preparation* (F=15; O=45)
Knowledge and understanding of the basic plan reading and preparation (i.e. site plans, boundary plans, highway plans, profile and cross sections, horizontal and vertical curves, pipeline plans, foundation plans, and developing existing and finished contours). A basic knowledge of the terminology and principles of drafting, including computer-aided drafting (CAD).

- 8) *First Aid & Safety* (F=15; O=15)
Basic knowledge of treatment practices for a variety of medical emergencies. Knowledge of traffic control and safety procedures for a variety of surveying and construction operations, including Occupational Safety and Health Administration (OSHA) standards.
- 9) *Principles of the Profession* (F=10; O=10)
Knowledge of surveying ethics and technical standards. Show responsibility in the profession (i.e. attire, honesty, respect for personal property), awareness of related professional association.

TOTAL NUMBER OF QUESTIONS = 180, TIME = SIX HOURS

SECOND SPECIALTY:

As can be seen on the accompanying exam matrix, if one were to also sign up for a second specialty examination, you would be given another 60 questions (30 each in two different work elements).

For example, if you applied to take the Level II “field” exam, you would be given a test with 180 questions distributed as shown in the exam matrix. If you also wanted to take a second specialty in the “office” track, your second exam would consist of 60 additional questions distributed in the two work elements (Survey Computations and Plan Reading & Preparation) shown on the matrix and you would be given one additional hour to complete both exams.

TYPICAL TEST QUESTIONS

The problems were selected by the Board to illustrate the type and range of difficulty of the examination questions, but they do not represent the full range of sub-topics in each subject area.

- 1.) If a distance of 215.21 feet is measured at a $+21^\circ$ slope, what is the horizontal distance:

A.) 215.00	B.) 215.21	C.) 200.92
D.) 201.92	E.) 215.42	
- 2.) What is the change in elevation in problem #1:

A.) 75.21	B.) 21.76	C.) 77.10
D.) 77.12	E.) 3.00	
- 3.) For every $\pm 15^\circ$ Fahrenheit in temperature change, what is the error in a 100.00 ft. chain:

A.) 0.01	B.) 0.10	C.) 0.02
D.) 0.20	E.) 0.00	
- 4.) Prior to entering private property to search for a survey point, it is best to first:

A.) Proceed because it is your responsibility	B.) Get a court order ahead of time
C.) Proceed only with a police escort	D.) Wait until the property owner is not at home
E.) Talk to the property owner ahead of time and politely explain what you are doing	
- 5.) Approximately how many yards are in 950 meters?

A.) 869	B.) 1039	C.) 1170
D.) 1228	E.) 1306	
- 6.) A benchmark is:

A.) A high water mark on a canyon wall	B.) A known permanent elevation	C.) A reference point for a plumb bob
D.) An unknown elevation	E.) Any flat rock on a mesa	
- 7.) What surveying system uses the terms “township” and “range”:

A.) Hydrographic	B.) Metes & Bounds	C.) Public lands survey
D.) Lot & Block	E.) Flat Earth Society	
- 8.) In Figure 1, pg 19, what is the slope of the line A-B:

A.) +1.00%	B.) +4.24%	C.) -4.24%
D.) -1.00%	E.) -4.24%	
- 9.) Control traverse closure standards relate to

A.) Number of angles repeated	B.) Number of angles turned	C.) Positional error
D.) Type of total station used	E.) Type of theodolite used	
- 10.) For average level work under normal conditions the length of sights should not exceed

A.) 50 feet	B.) 300 feet	C.) 800 feet
D.) 1000 feet	E.) As far as the rod can be seen	

- 11.) Which one of the following is an input device
 A.) Central processing unit B.) Digitizer C.) RAM
 D.) Monitor E.) Plotter
- 12.) When setting a R.P. to a control point, what does R.P. mean?
 A.) Reverse polarity B.) Reverse point C.) Right point
 D.) Reference point E.) Replacement point
- 13.) A burn that is red in color is a:
 A.) 1st degree burn B.) 2nd degree burn C.) 3rd degree burn
 D.) 4th degree burn E.) 5th degree burn
- 14.) The best way to treat bleeding is:
 A.) Direct Pressure B.) Elevation C.) Pressure point
 D.) Tourniquet E.) Apply an ice pack
- 15.) The sum of the interior angles of a closed Traverse with 8 sides:
 A.) 360 degrees B.) 540 degrees C.) 720 degrees
 D.) 900 degrees E.) 1080 degrees
- 16.) A traverse that was 2702.322 ft. long had an error of .081 ft. What is the error of closure:
 A.) 1/5000 B.) 1/15221 C.) 1/32020
 D.) 1/33362 E.) 1/2072
- 17.) The sum of the arithmetic check in figure 2, pg 19, is:
 A.) +10.32 B.) - 9.32 C.) - 10.32
 D.) + 9.32 E.) 12.42
- 18.) The phrase for adjusting a level:
 A.) Calibrating B.) Looping C.) Pegging
 D.) Posting E.) Double-centering
- 19.) A plat is drawn at a scale of 1" = 50'. What change is required to produce a drawing at 1" = 80'?
 A.) Multiply by 1.6 B.) Multiply by 6.25 C.) Divide by 6.25
 D.) Multiply by 0.625 E.) Multiply by 0.80
- 20.) The complementary angle to a positive vertical angle:
 A.) horizontal B.) nadir C.) central
 D.) oblique E.) zenith
- 21.) A rod is defined as:
 A.) 16 ft. B.) 16.5 ft. C.) 33.0 ft.
 D.) 50 ft. E.) 66 ft.
- 22.) In using an EDM you must correct for the following conditions:
 A.) Altitude B.) Temperature C.) Rain fall
 D.) Fog E.) Reflection
- 23.) Distance A in Figure #3 is:
 A.) Radial offset B.) External distance C.) Sub-radial extension
 D.) Mid ordinate E.) Y factor
- 24.) A distance of 2104.21 feet is measured from the beginning point of a traverse. What is the station at the end point:
 A.) 2+104.21 B.) 21+04.21 C.) 210+4.21
 D.) 2104.21 E.) 0+00.00
- 25.) You have just closed the horizon at a traverse point. What is the sum of the angles:
 A.) 90 B.) 180 C.) 270
 D.) 360 E.) 720
- 26.) What is the error in angle measurement sighting a range pole that is 0.1 meter off line on a 1000 foot sight?
 A.) 0° 00' 21" B.) 0° 00' 57" C.) 0° 01' 08"
 D.) 0° 03' 42" E.) 0° 13' 45"

TYPICAL TEST ANSWERS

- | | | | |
|--------|--------|--------|--------|
| 1.) C | 2.) D | 3.) A | 4.) E |
| 5.) B | 6.) B | 7.) C | 8.) D |
| 9.) C | 10.) B | 11.) B | 12.) D |
| 13.) A | 14.) A | 15.) E | 16.) D |
| 17.) C | 18.) C | 19.) D | 20.) E |
| 21.) B | 22.) B | 23.) B | 24.) B |
| 25.) D | 26.) C | | |

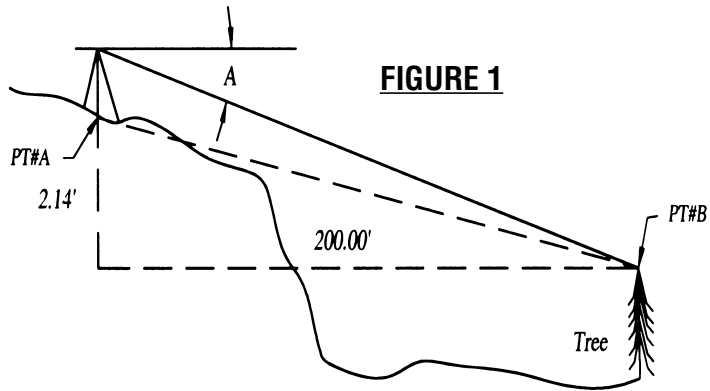


FIGURE 1

FIGURE 2

PT#	B.S.	H.I.	F.S.	ELEV.
BM#1	1.21			
TP1	0.89		3.21	
BM#2			9.21	
	==		==	

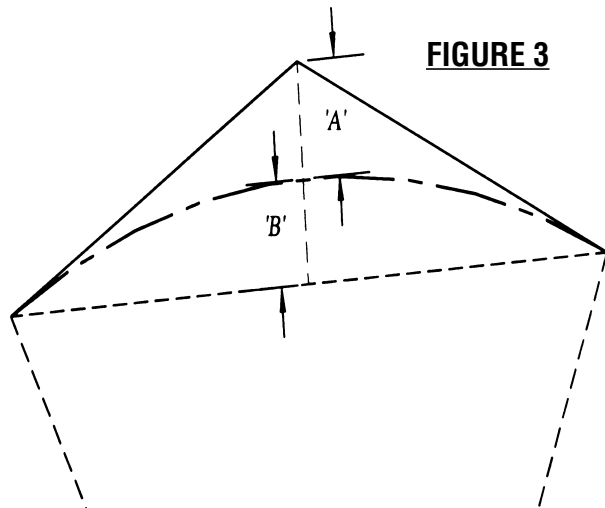


FIGURE 3

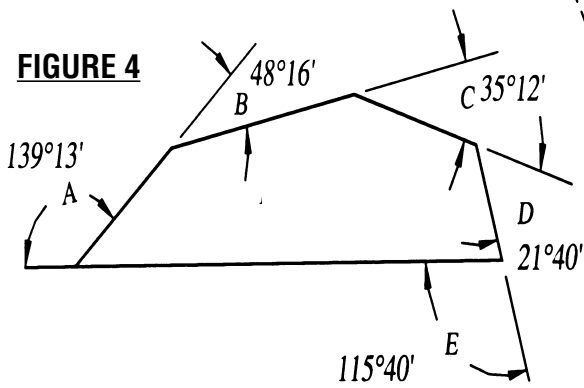


FIGURE 4

LEVEL II EXAMINATION MATRIX

NUMBER OF QUESTIONS PER WORK ELEMENT

Work Element	Field	Office	For a Second Specialty Examination	
			Field	Office
1) Types of Surveys	10	10		
2) Field Equipment & Instruments	35	15	30	
3) Survey Computations	40	55		30
4) Control Points: Horizontal & Vertical	10	10		
5) Field Operations	35	10	30	
6) Field Notes	10	10		
7) Plan Reading & Preparation	15	45		30
8) First Aid & Safety	15	15		
9) Principles of the Profession	10	10		
Total Questions	<u>180</u>	<u>180</u>	<u>60</u>	<u>60</u>

LEVEL III QUALIFICATIONS

SPECIALTY AREAS

FIELD:		OFFICE:	
Level II Experience	3000 hours (1.5 years)	Level II Experience	3000 hours (1.5 years)
PLUS		PLUS	
Party Chief - Boundary	4000 hours	Chief Computer Operator	4000 hours
Party Chief - Construction	or 2.0 years		or 2.0 years
TOTAL	3.5 Years	TOTAL	3.5 Years

Level III hours are cumulative: 4000 hours as a Party Chief plus the 3000 hours required for Level II equals 7000 hours total (3.5 Years minimum)

(Of the 7000 hours, 1750 hours can be education) Classroom or correspondence studies will be counted toward the 1750 hours provided a transcript is provided. The 1750 hours constitutes 2.33 years full time schooling based upon a minimum of 12 credit hours per semester or quarter. 1 CEU = 10 CLASSROOM HOURS = 0.5 CREDIT HOURS

For those applicants who wish to test in additional specialty areas, one year of additional experience must be documented in each specialty field.

LEVEL III

SURVEY TECHNICIAN CERTIFICATION

POSITION DESCRIPTION, WORK ELEMENTS AND TYPICAL QUESTIONS

POSITION DESCRIPTION

In addition to the Levels I and II requirements, **Level III Technicians** are required to demonstrate a thorough knowledge of survey computations, types of surveys and field operations. The individual in this position is well versed with field note reduction and in depth plan interpretation and preparation. The Level III technician possesses supervisory skills and a detailed working knowledge of standard field and office procedures. The technician has knowledge of the principles of the profession and various technical standards. Work Elements further describe the requirements related to this position.

Test problems will be taken from the following work elements:

- 1) *Types of Surveys* (F=7, O=7)
Know the principles and methods used in performing a variety of types of surveys such as: photo control surveys, state plane coordinate surveys, public land surveys, metes and bounds surveys, GPS surveys, construction surveys, and as-built surveys.
- 2) *Field Equipment & Instruments* (F=34, O=11)
Extensive knowledge of proper field procedures, knowledge of the care, cleaning, and use of a variety of surveying tools and equipment, including field radios. Know how to operate, check, and perform basic field adjustments on rods, compass, transits, levels, tribrachs, theodolites, total stations, robotic total stations, data collectors, tripods, and GPS equipment. Some historical knowledge is required.
- 3) *Survey Computations* (F=21, O=21)
Have extensive knowledge of trigonometry, geometry and algebra as related to traverse, inverse and intersection computations. Be capable of performing horizontal and vertical traverse adjustments, area and quantity computations, and horizontal and vertical curve computations.
- 4) *Control Points: Horizontal & Vertical* (F=8, O=8)
Know when to use, how to obtain, and how to interpret control point records and data sheets, as well as locate points in the field.
- 5) *Field Operations* (F=30 -see matrix, O=8)
Have a knowledge of a wide variety of surveying field operation methods including but not limited to: traversing; triangulation; trilateration; observation of the Sun and Polaris for True North determination; repeating observations and precision measurements using steel tapes and theodolites; construction layout methods and procedures. Know procedures for GPS surveys.
- 6) *Field Notes* (F=7, O=7)
Know how to create, reduce, and check orderly field notes for standard surveying operations such as but not limited to: leveling, traversing, topographic mapping, construction layout, as-built surveys, boundary surveys, profile and cross section surveys.

- 7) *Plan Reading & Preparation* (F=8, O=30)
Have a knowledge and understanding of plan reading and preparation (i.e. site plans, boundary plans, highway plans, profiles and cross sections, horizontal and vertical curves, pipeline plans, foundation plans, and developing existing and finished contours).
- 8) *First Aid & Safety* (F=11, O=11)
Basic knowledge of treatment practices for a variety of medical emergencies. Have a general knowledge of traffic control and safety procedures for surveying and construction operations including Occupational Safety and Health Administration (OSHA) standards.
- 9) *Principles of the Profession* (F=7, O=7)
Have a knowledge of ethics and the various technical standards of groups such as ALTA, NGS, NSPS, ACSM, BLM, and ASCE. Show responsibility in the profession (i.e. attire, honesty, respect for personal property) and awareness of related professional associations.
- 10) *Office Operations* (F=7, O=30)
Using hand calculations or micro-computer software, be able to enter field data and produce positional information (i.e. leveling, traversing, as-built surveys, topographic mapping). Have a knowledge and familiarity with general applications of computer aided drafting (CAD). Have knowledge of microcomputer operating system and hardware peripherals.
- 11) *Supervisory Skills* (F=10, O=10)
Have a basic knowledge and familiarity with: client contacts, dealing with the public and governmental agencies, field crew management, scheduling, equipment and supplies management. Have a knowledge of general company policies as they relate to field and office operations, office work flow procedures, and field and office problem solving techniques. Also have a knowledge of proper record keeping, time keeping, and job charges. Be able to coordinate and supervise field work, staking and stake marking for a variety of standard types of surveys. Have a general familiarity with local and state land use regulations as they relate to lot site development.

TOTAL NUMBER OF QUESTIONS = 150, TIME = SIX HOURS

SECOND SPECIALTY:

As can be seen on the accompanying exam matrix, if one were to also sign up for a second specialty examination, you would be given another 60 questions (30 each in two different work elements).

For example, if you applied to take the Level III "Field" (Boundary or Construction) exam, you would be given a test with 150 questions distributed as shown in the exam matrix. If you also wanted to take a second specialty in the "Office" track, your second exam would consist of 60 additional questions distributed in the two work elements (Office Operations and Plan Reading & Preparation) shown on the matrix and you would be given one additional hour to complete both exams.

If your main Level III Exam was in the Field track (Boundary or Construction), then a second specialty exam also in the Field track (Construction or Boundary) will have only 30 questions in the Field Operations Work Element, and you would be given one additional hour to complete both exams.

TYPICAL TEST QUESTIONS

The problems were selected by the Board to illustrate the type and range of difficulty of the examination questions, but they do not represent the full range of sub-topics in each subject area.

- 1.) If a distance of 215.21 feet is measured at a -21° slope with a 100 foot chain that is 0.02 feet short. What is the horizontal distance:

A.) 215.00 feet	B.) 200.87 feet	C.) 200.92 feet
D.) 201.92 feet	E.) None of the above.	
- 2.) What is the change in elevation in problem #1:

A.) 75.21 feet	B.) 21.76 feet	C.) 77.11 feet
D.) 77.12 feet	E.) 12.77 feet	
- 3.) For a $+45^\circ$ F change in temperature, what is the error in a 100.00 foot chain?

A.) 0.03 feet	B.) 0.01 feet	C.) 0.02 feet
D.) 0.04 feet	E.) 0.06 feet	

- 4.) What is the meaning of the centerline station equation $125 + 15 AH = 127 + 30 BK$?
- A.) 230' gain in traverse length B.) 730' gain in traverse length C.) 230' loss in traverse length
D.) 215' gain in traverse length E.) 215' loss in traverse length
- 5.) In determining earthwork quantities, the area of a cross-section on a plotted map is 7.85 square inches. The vertical scale is $1'' = 5'$, and the horizontal scale is $1'' = 20'$. What is the end area in square yards?
- A.) 8.7 B.) 26.2 C.) 29.1
D.) 87.2 E.) 261.7
- 6.) In retracing an old survey in the rectangular survey system a quarter corner is lost. The two section corners on either side are found. What method is used to reset the missing quarter corner?
- A.) Protraction B.) Proportion C.) Half actual distance between section corners
D.) Subdivision E.) Resection
- 7.) In leveling, FS's and BS's are balanced to minimize the following error(s)
- A.) Instrument error B.) Operator error C.) Rod error
D.) Heat error E.) Refraction and curvature
- 8.) What is the area (to the nearest square foot) of the lot in Figure 1, pg 24
- A.) 40,219 square feet B.) 40,220 square feet C.) 41,237 square feet
D.) 41,238 square feet E.) 43,560 square feet
- 9.) Given the following circular curve data: PC 128-00, PT 138-00, 4 degree curve, the deflection angle for the station 131-00 measured from the PC will be:
- A.) 1 deg 00 min B.) 1 deg 30 min C.) 3 deg 00 min
D.) 6 deg 00 min E.) 12 deg 00 min
- 10.) You are asked to check the side slope on an open trench in type A soil. The trench will be open less than 24 hours. What is the maximum side slope that is allowed by OSHA 29 CFR Part 1926 for a 12' deep ditch?
- A.) 1/4:1 B.) 1/2:1 C.) 3/4:1
D.) 1:1/2 E.) 1:1/4
- 11.) Given the circular curve data on a set of highway plans (see Figure 2, page 25). What is the station of the PC?
- A.) 4+400 B.) 4+21.22 C.) 3+09.50
D.) 3+5.21 E.) 4+50.22
- 12.) A data collector or "electronic field book" does not eliminate the need for recording
- A.) Horizontal angles measured B.) Vertical angles measured C.) Slope distance measured
D.) Horizontal distance measured E.) Diagrams
- 13.) Given the circular curve data in Figure 2, pg 25, what is the station of PT?
- A.) 5+23.50 B.) 5+32.83 C.) 5+50.21
D.) 4+95.21 E.) 6+02.17
- 14.) When an accident occurs, the first thing to check for is
- A.) Consciousness B.) Breathing C.) Pulse
D.) Bleeding E.) Broken bones
- 15.) The sum of the interior angles of a closed traverse with 21 sides:
- A.) 3420 degrees B.) 5400 degrees C.) 7200 degrees
D.) 2730 degrees E.) 2695 degrees
- 16.) A traverse that was 3702.322 feet long had an error of 0.07 feet in latitudes and 0.15 feet in departures. What is the error of closure:
- A.) 0.17 feet B.) 0.10 feet C.) 0.15 feet
D.) 0.21 feet E.) 0.073 feet
- 17.) The traverse precision to the nearest foot in Figure 3, pg 25 is:
- A.) 1/15,221 B.) 1/2,702 C.) 1/19,227
D.) 1/20,927 E.) 1/16,325
- 18.) The cosine of $57^\circ 21'$ is equal to the sine of _____?
- A.) $37^\circ 15'$ B.) $27^\circ 39'$ C.) $15^\circ 21'$
D.) $32^\circ 39'$ E.) $23^\circ 29'$

FIGURE 2

$PI = 4+21.22$
 $R = 2864.79$
 $D = 2^\circ$
 $DELTA = 4^\circ 28'$

FIGURE 3

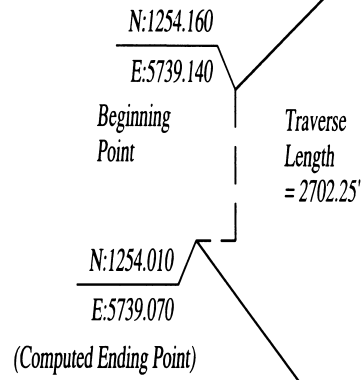


FIGURE 4

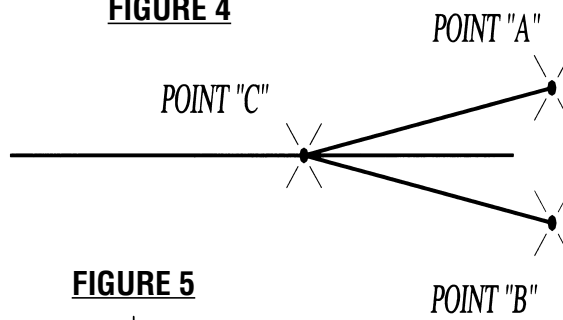


FIGURE 5

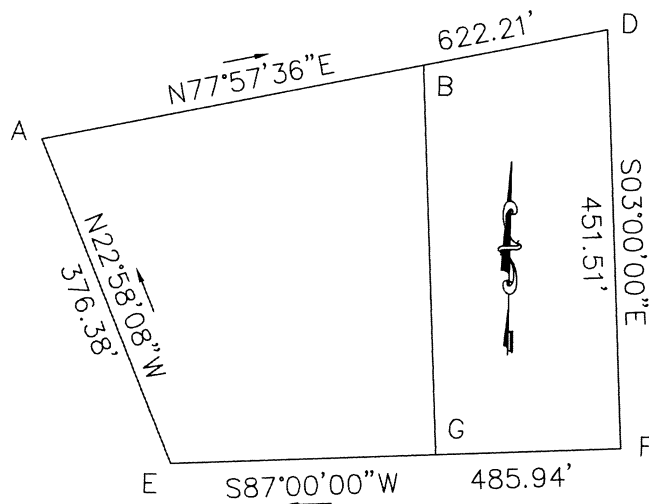
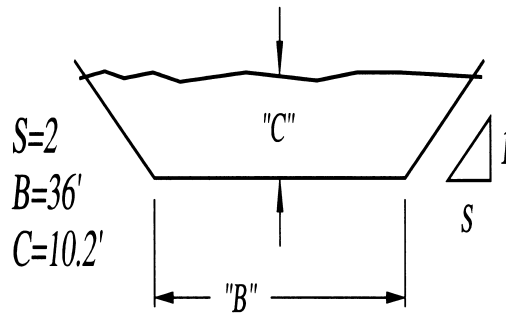


FIGURE 6

LEVEL III EXAMINATION MATRIX

NUMBER OF QUESTIONS PER WORK ELEMENT

Work Element	Field Boundary	Construction	Office Computer
1) Types of Surveys	7	7	7
2) Field Equipment & Instruments	34	34	11
3) Survey Computations	21	21	21
4) Control Points: Horizontal & Vertical	8	8	8
5) Field Operations	22 Bound. 8 Const.	8 Bound. 22 Const.	8
6) Field Notes	7	7	7
7) Plan Reading & Preparation	8	8	30
8) First Aid & Safety	11	11	11
9) Principles of the Profession	7	7	7
10) Office Operations	7	7	30
11) Supervisory Skills	<u>10</u>	<u>10</u>	<u>10</u>
Total Questions	150	150	150

LEVEL IV QUALIFICATIONS

SPECIALTY AREAS

SURVEY FIELD MANAGER

Level IV Experience	4,000 hours (2.0 years)
PLUS - Level II and Level III Experience	
Party Chief — Boundary	7,000 hours
Party Chief — Construction	or 3.5 years
TOTAL	5.5 Years

SURVEY OFFICE MANAGER

Level IV Experience	4,000 hours (2.0 Years)
PLUS - Level II and Level III Experience	
Chief Computer Operator	7,000 hours
Chief Draftsperson	or 3.5 years
TOTAL	5.5 Years

Level IV hours are cumulative: 7,000 hours at Level II AND Level III plus 4,000 hours are required for Level IV equals 11,000 hours total. (5.5 Years minimum)

(Of the 11,000 hours, 2,750 hours can be education). Classroom or correspondence studies will be counted toward the 2,750 hours if a transcript is provided. The 2,750 hours constitutes 3.66 years full time schooling based upon a minimum of 12 credit hours per semester or quarter. 1 CEU = 10 CLASSROOM HOURS = 0.5 CREDIT HOURS

For those who wish to test in the other area, one year of additional experience must be documented in that field.

PHILOSOPHY AND OBJECTIVES OF LEVEL IV

The Board recognizes that in many Surveying and Mapping firms the principal/professional performs the tasks and functions of a chief of parties/office manager. However, in many other firms those tasks are performed by technicians. The purpose of this exam is to test and certify those individuals.

The testing for this level differs significantly in format and content from the other three levels. **Before you open the sealed envelope, realize that the thoroughness required by the Board will result in reports of 10 to 30 pages in length on which you will have expended in excess of 30 hours of research and writing.**

The test is in a “take home/open book” format and will consist of two or more essay questions which will be sent to the individual. The examinee will be given two months to complete the examination and return it to the Certification Board. The responses must be typed in report form with copies of complete supporting documentation and have an affidavit that the exam was completed by the examinee.

Among the knowledge, tasks and skills subject to evaluation by this test will be:

- Budgeting and project cost control
- Clear and concise communications
- Client contact
- Codes and regulations
- Delegating and coordinating
- Evaluating and selecting equipment and supplies
- Good management practices
- Good organizational ability
- Independent investigating/Researching - Problem solving
- Permitting processes
- Project estimating
- Scheduling
- Staffing
- Thorough understanding of plans and specifications
- Training
- Understanding company structure

In summary, this individual is someone who has the level of judgment to put all of the pieces together, weed out extraneous information and respond to a variety of situations while maintaining quality and minimizing costs.

An examinee in the Field route must be capable of answering questions in either the Boundary or Construction area. An examinee in the Office route must be capable of answering questions in either the Computer or the Drafting area.

LEVEL IV **SURVEY TECHNICIAN CERTIFICATION** *POSITION DESCRIPTION AND WORK ELEMENTS*

POSITION DESCRIPTION

In addition to the **Level I, II** and **III** requirements, **Level IV** technicians are required to demonstrate a more comprehensive knowledge of surveys and field operations. This shall include but is not limited to independent judgment, communication and supervisory abilities. The individual in this position is well versed in the day to day operational functions of a field and/or office survey organization. The **Level IV** technician possesses advanced technical and supervisory skills. Work elements listed below further describe the requirements related to this position.

Essay questions will include the following work elements:

- 1) *Types of Surveys*: Know the principles of performing basic surveys such as leveling, traversing, public land surveys, metes and bounds surveys, topographic surveys, construction surveys, horizontal control surveys, State Plane Coordinate surveys and as-built surveys. In addition, be familiar with requirements of global positioning (GPS) and geographic/land information systems (GLIS). Have a general knowledge of hydrographic, mining and photogrammetric surveying.
- 2) *Field Equipment & Instruments*: Be familiar with proper procedures for the care, cleaning and use of a variety of surveying tools and equipment, including field radios. Have ability to inventory, evaluate, specify, and purchase field equipment. Be able to determine proper equipping of personnel. Know how to operate, check, and perform basic field adjustments on theodolites, total stations, data collectors, levels, compass, tribrachs, and tripods. This would include repeating observations and steel taping. Have ability to inventory, evaluate, specify, and purchase field instruments. Some historical knowledge is required.
- 3) *Survey Computations*: Perform mathematical checks of trigonometry, geometry, algebra, coordinate geometry, and basic surveying computations. Having a working knowledge of hand-held calculators is important. Also be able to perform traverse and level loop computations including closure, precision determination and adjustment computations. Be familiar with taping corrections, basic principles of measurement, EDM baseline comparison computations, error propagation, and astronomic azimuth determination. Perform and/or check lot, area, and intersection (bearing-bearing, distance-distance, bearing-distance) computations. Have a familiarity with land use regulations as they relate to lot and site development.
- 4) *Control Points: Horizontal & Vertical*: Know when to use, how to obtain, and how to interpret control point records and data sheets.
- 5) *Field Operations*: Be able to coordinate and supervise field work for a variety of standard types of surveys. Also have a knowledge of proper record keeping, timekeeping, and job expenses.
- 6) *Field Notes*: Know how to keep, reduce, and check (for completeness and accuracy) neat and orderly field notes for standard surveying operations: leveling, traversing, topographic mapping, layout, as-built surveys, boundary surveys, profile and cross section surveys.
- 7) *Plan Reading & Preparation*: Have a knowledge and understanding of plan reading and preparation. Also have a knowledge of and familiarization with general applications of computer aided drafting (CAD). Be able to coordinate design elements obtained from professionals and format into final drawings.
- 8) *First Aid & Safety*: Have a basic knowledge of treatment practices for a variety of medical emergencies. Have a general knowledge of traffic control and safety procedures for a variety of surveying and construction operations.
- 9) *Principles of the Profession*: Have a knowledge of ethics and technical standards and organizations such as ALTA, NGS, ACSM, BLM, ASCE. Show responsibility in the profession (i.e. attire, honesty, respect for personal property).
- 10) *Office Operations*: Using hand calculations or micro-computer software, be able to enter or check field data and the resulting positional information. Have a knowledge of microcomputer operating systems and peripheral computer equipment. Be able to inventory, evaluate, and specify computer software peripheral equipment and supplies.
- 11) *Supervisory Skills*: Have a comprehensive knowledge of and familiarity with: client contacts, dealing with the public and governmental agencies, field crew management, scheduling, equipment and supplies management. Have knowledge of on-site office operation, office work flow procedures, and field and office problem solving techniques. Also, be able to evaluate personnel performance, and perform basic budgeting and cost control techniques. Have ability to train personnel in all aspects of field and/or office surveying practices.

SEALS AND STAMPS

There is no official seal or stamp which can be applied to drawings, specifications, or other documents prepared by a certified survey technician. Use of an individually designed seal or stamp which refers to the NSPS-ACSM certification number is unauthorized because the NSPS-ACSM certification has no legal standing by itself. Use of “custom-designed” seals and stamps will discredit NSPS-ACSM and decrease the value of issued certificates for everyone.

In those cases where it is appropriate to call attention to work having been done by an NSPS-ACSM certified survey technician, it is suggested that you write CST (Certified Survey Technician) after your name, followed by your level of certification and your certification number; i.e., John J. Jones, CST I(0588-1234) or Susan S. Smith, CST Computer II (0588-1234).

The use of the CST logo is permitted on business cards. However, if this logo is to be used on stationery it shall be accompanied by the following support statement. We support and encourage NSPS/ACSM certification. It is not acceptable to print the NSPS/ACSM certified mark on letterhead stationery without the support statement because it then looks like the company is NSPS/ACSM certified.

If NSPS-ACSM receives knowledge of the conviction of any CST for improper use of the designation of certified survey technician, the CST designation will be revoked and the individual will not be allowed to continue in the program.

BIBLIOGRAPHY/REFERENCES

BY TOPIC

FOR SURVEY TECHNICIAN CERTIFICATION

FUNDAMENTAL SURVEYING TEXTS

Elementary Surveying, Wolf & Ghilani
Surveying, Evett
Surveying Practice, Kissam
Surveying 10th Edition, Moffit/Bossler
Surveying: Theory and Practice, Davis
1001 Solved Surveying Fundamentals Problems, Van Sickle

OTHER SURVEYING TEXTS

Land Survey Review Manual, Buckner
Land Surveyor Reference Manual, Harbin
Solutions for Survey Review Manual, Harbin
GPS For Land Surveyors, Van Sickle
Land Surveying Computations, Buckner
Basic Geodesy: An Introduction to History and Concepts
of Modern Geodesy, Smith
Getting started with Geographic Information Systems, Clarke

BOUNDARY

Brown's Boundary Control and Legal Principles (4th Edition)
Robillard and Wilson
Compass Land Surveying, Sipe
Evidence and Procedure for Boundary Location (3rd Edition)
Brown, Robillard and Wilson
The Legal Elements of Boundaries and Adjacent
Properties, Skelton
Land Survey Descriptions, Wattles

PUBLIC LANDS

Manual of Instruction (BLM)
Restoration of Lost and Obliterated Corners and Subdivision
Corners — 1883-1974, Landmark Enterprises
Land Survey Systems, McEntyre
A Guide to Understanding Land Surveys, Estopinal

NATIONAL SURVEY STANDARDS

Minimum Standard Detail Requirements for and
Classifications of ALTA/ACSM Land Title Surveys
Standards & Specifications for Geodetic Control Networks,
Federal Geodetic Control Committee
Geometric Geodetic Accuracy Standards & Specifications
for Using GPS Relative Positioning Techniques, Federal
Geodetic Control Committee
Minimum Standards for Surveys (Individual States)

DRAFTING AND COMPUTER DRAFTING

Surveying Drafting, Wattles
Inside AutoCAD
Introducing Microsoft Windows, Microsoft Corporation

CONSTRUCTION

Measuring Practice on the Building Site, Vandenberg
Manual on Construction Layout, NSPS/ACSM
Surveying with Construction Applications, Kavanaugh
Construction Surveying and Layout, Crawford

ROUTE SURVEYING

Route Location and Design, Hickerson
Route Location and Design, Meyer & Gibson

FIRST AID AND SAFETY

Standard First Aid, American Red Cross
OSHA Title 29, Chapter XVII, Part 1926, Occupational
Safety and Health Standards for the Construction Industry
with amendments (latest version)

DICTIONARIES

American College Dictionary, Random House (or any other
college dictionary)
Glossary of the Mapping Sciences, 1994, ASCE, ACSM
& ASPRS
Definitions of Surveying and Associated Terms, ACSM

NOTE:

You should review the work elements for which you will
be testing. If there are areas in which you feel you need
additional study, you should be able to find one or two
possible books from this list to assist you. Many of these
books or others like them are quite often available at
public libraries or may be borrowed from acquaintances in
the field.

Please note that you do not need all of these books.

***This is an open book test. These and other materials can be
brought into the testing facility.***

NSPS - SURVEY TECH
6 Montgomery Village Avenue, Suite #403
Gaithersburg, MD 20879-3557