Learning Objectives

Monday, March 2, 2020 9:39 AM

Learning objectives

<u>Homework Assignment</u>

Do the following problems from the textbook

2.4 (10 points)
2.5 (10 points)
2.7 (10 points)
2.8 (10 points)
2.9 (10 points)
2.11 (10 points)
2.14 (10 points)
2.15 (10 points)
2.16 (10 points)
2.16 (again) Convert the angles to decimal degrees (10 points)

Homework Assignment (cont.)

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Asterisks (*) indicate problems that have partial answers given in Appendix G .

2.1 List the five types of measurements that form the basis of traditional plane surveying.

2.2 Give the basic units that are used in surveying for length, area, volume, and angles in
- **(a)** The English system of units.
- **(b)** The SI system of units.

2.3 The easting coordinate for a point is 632,506.084 m. What is the coordinate using the
- **(a)** Survey foot definition?
- **(b)** International foot definition?
- **(c)** Why was the survey foot definition maintained in the United States?

2.4 Convert the following distances given in meters to U.S. survey feet:
****(a)** 2145.341 m **(b)** 721.142 m **(c)** 10,254.06 m

2.5 Convert the following distances given in survey feet to meters:
****(a)** 600.00 sft **(b)** 100,215.23 sft **(c)** 2500.00 sft

2.6 Compute the lengths in survey feet corresponding to the following distances measured with a Gunter's chain:
****(a)** 10 ch 13 lk **(b)** 16 ch 2 lk **(c)** 3 ch 54 lk

2.7 Express 48,983 sft^2 in:
****(a)** acres **(b)** hectares **(c)** square Gunter's chains

2.8 Convert 25.654 acres to:
(a) square survey feet **(b)** hectares **(c)** square Gunter's chains

2.9 What are the lengths in feet and decimals for the following distances shown on a building blueprint?
(a) 22 ft 8-1/4 in. **(b)** 40 ft 6-1/2 in.

2.10 What is the area in acres of a rectangular parcel of land measured with a Gunter's chain if the recorded sides are as follows:
****(a)** 9.17 ch and 10.64 ch **(b)** 30 ch 6 lk and 24 ch 98 lk

2.11 Compute the area in acres of triangular lots shown on a plat having the following recorded right-angle sides:
(a) 52 m and 120 m **(b)** 221.32 ft and 125.58 ft

2.12 A distance is expressed as 1908.23 U.S. survey feet. What is the length in
****(a)** international feet? **(b)** meters?

2.13* On your first day at work, you realize that the total station you have only reads angles in grads. If you have to scale out 60°12′30″, how many grads will you have to measure?

2.14 Give answers to the following problems in the correct number of significant figures:
- ****(a)** sum of 23.15, 0.984, 124, and 12.5
- **(b)** sum of 14.15, 7.992, 15.6, and 203.67
- **(c)** product of 104.56 and 66.8

Homework Assignment (cont.)

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2.15 Express the value or answer in powers of 10 to the correct number of significant figures:
  (a) 363.25
  (b) 1200
  (c) square of 363.25
  (d) sum of (25.675 + 0.48 + 204.69) divided by 10.6

2.16 Convert the angles of a triangle to radians and show a computational check:
  ***(a)** 39°41′54″, 91°30′16″, and 48°47′50″
  (b) 82°17′43″, 29°05′54″, and 68°36′23″

2.17 Why should a number 2 pencil not be used in field notekeeping?

2.18 If 25 decimals make up a quarter of an acre, how many square Gunter's chains are there in 10 decimals?

2.19 When you embark upon carrying out surveys in a foreign country, why is it important to have an appreciation of that country's units of distance and angular measure?

2.20 Why is sketching important when carrying out any survey?

2.21 Why is it important to keep legible, tidy, and clean field books?

2.22 Distinguish between original and copied field notes.

2.23 In which cases are copied field notes inadmissible?

2.24 What are some of the reasons behind making wrong field-book entries?

2.25 Justify the requirement to list in a field book the makes and serial numbers of all instruments used on a survey.

2.26 How can Bluetooth technology be used in survey instrumentation?

2.27 Discuss the advantages of survey controllers.

2.28 Search the Internet and find at least two sites related to
  (a) Manufacturers of survey controllers.
  (b) Manufacturers of total stations.
  (c) Manufacturers of GNSS receivers.

2.29 How can survey controller data be stored?

2.30 Why is it important to be aware of the battery life of your survey equipment?

2.31 Describe what is meant by the phrase "field-to-finish."

2.32 Why are sketches in field books not usually drawn to scale?

Units, Significant Figures and Field Notes

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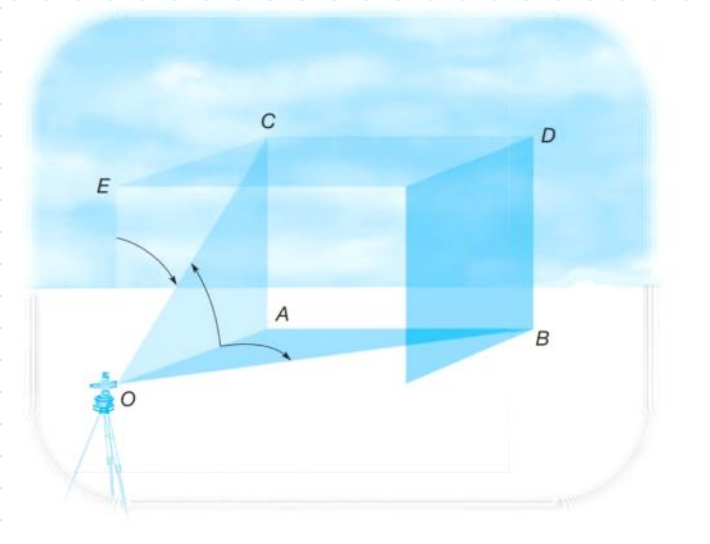

Types of Observations

(1) horizontal angles, (2) horizontal distances, (3) vertical (or zenith) angles, (4) vertical distances, and (5) slope distances.

By using combinations of these basic observations, it is possible to compute relative positions between any points. Equipment and procedures for making each of these basic kinds of observations are described in later chapters of this book.

Question: Using the figure above, give an example of each type of observation.

Units of Measurement and Conversions

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Magnitudes of measurements (or of values derived from observations) must be given in terms of specific units. In surveying, the most commonly employed units are for length, area, volume, and angle. Two different systems are in use for speci- fying units of observed quantities, the English and metric systems. Because of its widespread adoption, the metric system is called the International System of Units, abbreviated SI.

SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

Angle Measurements

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The unit of angle used in surveying is the degree, defined as 1/360 of a circle. One degree (1°) equals 60 min, and 1 min equals 60 sec.

<u>Example</u>

59 degrees 45 minutes 33 seconds = $59^\circ\ 35'\ 33''$

Conversion to decimal degrees

$59^\circ\ 35'\ 33'' = 59+35/60+33/3600=59.592^\circ$

<u>Conversion to radians</u>

$360^\circ = 2\pi$ radians
$1^\circ = 1/360*2*3.141592635=0.017453292$ radians

59.592*0.017453292=1.040076577 radians
or
$59.592^\circ = 59.592/360*2*3.141592635=1.040076602$ radians

<u>Other less used methods</u>

Other methods are also used to subdivide a circle, for example, 400 grad (with 100 centesimal min/grad and 100 centesimal sec/min.

Another term, gons, is now used interchangeably with grads.

The military services use mils to subdivide a circle into 6400 units.

Significant Figures

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In recording observations, an indication of the **accuracy attained is the number of digits (significant figures) recorded.** By definition, the number of significant figures in any observed value includes the positive (certain) digits plus one (only one) digit that is estimated or rounded off, and therefore questionable.

For example, a distance measured with a tape whose smallest graduation is 0.01 ft, and recorded as 73.52 ft, is said to have four significant figures; in this case the first three digits are certain, and the last is rounded off and therefore questionable but still significant.

Two significant figures: 24, 2.4, 0.24, 0.0024, 0.020
Three significant figures: 364, 36.4, 0.000364, 0.0240
Four significant figures: 7621, 76.21, 0.0007621, 24.00.

What about zeros? Are they significant?

Zeros at the end of an integer value may cause difficulty because they may or may not be significant. In a value expressed as 2400, for example, it is not known how many figures are significant; there may be two, three, or four, and therefore definite rules must be followed to eliminate the ambiguity. **The preferred method of eliminating this uncertainty is to express the value in terms of powers of 10.**

2400

<u>Scientific Notation</u>

Two significant figures
2.4e2

Three significant figures

2.40e2

Four Significant figures

2.400e2

SIGNIFICANT FIGURES

For measured numbers, significant figures relate the certainty of the measurement. As the number of significant figures increases, the more certain the measurement. The means for obtaining the measurement also becomes more sophisticated as the number of significant figures increase.

Scientific notation is the most reliable way of expressing a number to a given number of significant figures. In scientific notation, the power of ten is insignificant. For instance, if one wishes to express the number 2000 to varying degrees of certainty:

2000 $\longrightarrow$ 2×10^3 is expressed to one significant figure
2000 $\longrightarrow$ 2.0×10^3 is expressed to two significant figures
2000 $\longrightarrow$ 2.00×10^3 is expressed to three significant figures
2000 $\longrightarrow$ 2.000×10^3 is expressed to four significant figures

What do these numbers imply as to the certainty? Let's see what the number can be distinguished from:

The number 2000 to one significant figure lies between:

$$1 \times 10^3 = 1000$$
$$2 \times 10^3 = 2000$$
$$3 \times 10^3 = 3000$$

It is a number that lies between 1000 and 3000 -- not very certain, is it.
The number 2000 to two significant figures lies between:

$$1.9 \times 10^3 = 1900$$
$$2.0 \times 10^3 = 2000$$
$$2.1 \times 10^3 = 2100$$

It is a number that lies between 1900 and 2100 -- more certain than before.
The number 2000 to three significant figures lies between:

$$1.99 \times 10^3 = 1990$$
$$2.00 \times 10^3 = 2000$$
$$2.01 \times 10^3 = 2010$$

It is a number that lies between 1990 and 2010 -- more certain, still.

Significant Figures (cont.)

Wednesday, January 05, 2011 1:48 PM

The number 2000 to four significant figures lies between:

$$1.999 \times 10^3$$
$$2.000 \times 10^3$$
$$2.001 \times 10^3$$

It is a number that lies between 1999 and 2001 -- even more certain.

The more significant figures in a measurement, the more sophisticated the means of measurement. You will see this in the laboratory. To measure out 200 mL of a solution using the marking stamped on the side of the beaker is quick and easy, but it is not as certain as a volumetric flask. When using a volumetric flask, care must be taken to bring the meniscus of the solution to a calibrated etch mark on the flask. Also, beakers are inexpensive pieces of glassware; volumetric flasks, because they are calibrated, are much higher in cost.

Being careless with significant figures may result in dire consequences. The following is a true story told to me by a Baltimore County middle school teacher concerning their mishap resulting from not considering the significance of significant figures:
The science teachers at a Baltimore County middle school wished to acquire a steel cube, one cubic centimeter in size to use as a visual aid to teach the metric system. The machine shop they contacted sent them a work order with instructions to draw the cube and specify its dimensions. On the work order, the science supervisor drew a cube and specified each side to be 1.000 cm. When the machine shop received this job request, they contacted the supervisor to double check that each side was to be one centimeter to four significant figures. The science supervisor, not thinking about the "logistics", verified four significant figures. When the finished cube arrived approximately one month later, it appeared to be a work of art. The sides were mirror smooth and the edges razor sharp. When they looked at the "bottom line", they were shocked to see the cost of the cube to be $500! Thinking an error was made in billing, they contacted the machine shop to ask if the bill was really $5.00, and not $500. At this time, the machine shop verified that the cube was to be made to four significant figure specifications. It was explained to the school, that in order to make a cube of such a high degree of certainty, many man hours were used. The cube had to be ground down, and measured with calipers to within a certain tolerance. This process was repeated until three sides of the cube were successfully completed. The number of man hours to prepare the cube cost $500. The science budget for the school was wiped out for the entire year. This school now has a steel cube worth its weight in gold, because it is a very certain cubic centimeter in size.

When handling significant figures in calculations, two rules are applied:

Multiplication and division -- round the final result to the least number of significant figures of any one term, for example:

Significant Figures (cont.)

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$$\frac{(15.03)(4.87)}{1.987} = 36.8$$

The answer, 36.8, is rounded to three significant figures, because least number of significant figures was found in the term, 4.87. The other terms, 15.03 and 1.987, each had 4 significant figures.

Addition and subtraction -- round the final result to the least number of decimal places, regardless of the significant figures of any one term, for example:

$$\begin{array}{r} 1.003 \\ 13.45 \\ +\ 0.0057 \\ \hline 14.4587 \end{array} \quad \text{rounds off to} \quad 14.46$$

The answer, 14.4587, was rounded to two decimal places, since the least number of decimal places found in the given terms was 2 (in the term, 13.45).

Suppose more than one mathematical operation is involved in the calculation? Such a calculation may be "deceptive" as to how many significant figures are actually involved. For instance:

$$\frac{(8.34 - 7.84)}{(15.05)(2.01)} = ?$$

The subtraction in the numerator must be performed first to establish the number of significant figures in the numerator. The subtraction results in:

$$\frac{0.50}{(15.05)(2.01)} = 0.017$$

Since the subtraction in the numerator resulted in a number to two significant figures (rounding to two decimal places), and the least number of significant figures in the resulting expression involving multiplication and division is now two significant figures, the final result must be rounded to two significant figures.

Surveying Computations

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In surveying, four specific types of problems relating to significant figures are encountered and must be understood.

1. Field measurements are given to some specific number of significant figures, thus dictating the number of significant figures in answers derived when the measurements are used in computations. I<u>n an intermediate calculation, it is a common practice to carry at least one more digit than required, and then round off the final answer to the correct number of significant figures</u>.

2. <u>There may be an implied number of significant figures</u>. For instance, the length of a football field might be specified as 100 yd. But in laying out the field, such a distance would probably be measured to the nearest hundredth of a foot, not the nearest half-yard.

3. <u>Each factor may not cause an equal variation</u>. For example, if a steel tape 100.00 ft long is to be corrected for a change in temperature of 15°F, one of these numbers has five significant figures while the other has only two. However, a 15° variation in temperature changes the tape length by only 0.01 ft.

4. <u>Observations are recorded in one system of units but may have to be con verted to another. A good rule to follow in making these conversions is to retain in the answer a number of significant figures equal to those in the observed value.</u> As an example, to convert 178 ft 6-3/8 in. to meters, the number of significant figures in the measured value would first be determined by expressing it in its smallest units. In this case, 1/8th in. is the smallest unit and there are (178*12*8)+(6*8)+3=7,139 of these units in the value. Thus, the measurement contains five significant figures, and the answer is 17,139 , (8 * 39.37 in./m) = 54.416 m, properly expressed with five significant figures. (<u>Note that 39.37 used in the conversion is an exact constant and does not limit the number of significant figures.)</u>

Rounding Numbers

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Rounding off a number is the process of dropping one or more digits so the answer contains only those digits that are significant. In rounding off numbers to any re- quired degree of precision in this text, the following procedures will be observed:

1. When the digit to be dropped is lower than 5, the number is written without the digit. Thus, 78.374 becomes 78.37. Also 78.3749 rounded to four figures becomes 78.37.

2. When the digit to be dropped is exactly 5, the nearest even number is used for the preceding digit. Thus, 78.375 becomes 78.38 and 78.385 is also rounded to 78.38.

3. When the digit to be dropped is greater than 5, the number is written with the preceding digit increased by 1. Thus, 78.386 becomes 78.39

Procedures 1 and 3 are standard practice. However, when rounding the value 78.375 in procedure 2, some people always take the next higher hundredth, whereas others invariably use the next lower hundredth. However, using the nearest even digit establishes a uniform procedure and produces better-balanced results in a series of computations. It is an improper procedure to perform two- stage rounding where, for example, in rounding 78.3749 to four digits it would be first rounded to five figures, yielding 78.375, and then rounded again to 78.38. The correct answer in rounding 78.3749 to four figures is 78.37. It is important to recognize that rounding should only occur with the final answer. Intermediate computations should be done without rounding to avoid problems that can be caused by rounding too early. Example (a) of Section 2.4 is repeated below to illustrate this point. The sum of 46.7418, 1.03, and 375.0 is rounded to 422.8 as shown in the “correct” column. If the individual values are rounded prior to the addition as shown in the “incorrect” column, the incorrect result of 422.7 is obtained.

Correct	**Incorrect**
46.7418	46.7
+ 1.03	+ 1.0
+ 375.0	+ 375.0
422.7718	422.7
(answer 422.8)	(answer 422.7)

Field Notes

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Field Notes

- Legal record of work done in the field
  - Property surveys - legal document
- Used in the office to perform computations
- Contain
  - Measurements
  - Sketches
  - Descriptions
- Computer files can also become records
- Photographs
- Requirements

  - Accuracy. This is the most important quality in all surveying operations.

  - Integrity. A single omitted measurement or detail can nullify use of the notes for computing or plotting. If the project was far from the office, it is time consuming and expensive to return for a missing measurement. Notes should be checked carefully for completeness before leaving the survey site and never “fudged” to improve closures.

  - Legibility. Notes can be used only if they are legible. A professional-looking set of notes is likely to be professional in quality. Arrangement. Note forms appropriate to a particular survey contribute to accuracy, integrity, and legibility.

  - Clarity. Advance planning and proper field procedures are necessary to ensure clarity of sketches and tabulations and to minimize the possibility of mistakes and omissions. Avoid crowding notes; paper is relatively cheap. Costly mistakes in computing and drafting are the end results of ambiguous notes.

Example Field Notes (Traversing)

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Traversing

Point	Direct	Reverse	diff
TS: at pt 20, HI = 5.65 ft			
10	0°00'00"	65°18'20"	
30	65°18'20"	130°36'50"	
angle	65°18'20"	65°18'30"	0°00'10"
10	130°36'50"	195°55'04"	
30	195°55'04"	261°13'59"	
angle	65°18'14"	65°18'55"	0°00'41"
10	0°00'01"	95°18'25"	
30	65°18'25"	130°36'32"	
angle	65°18'24"	65°18'07"	0°00'17"
Distances to pt 10, HR = 5.75 ft			
horiz	132.61	132.60	132.63
vert	+8.65	+8.67	+8.65
Distances to pt 30, HR = 5.75 ft			
horiz	91.27	91.29	91.27
vert	-2.51	-2.51	

Traversing

7

April 01, 2016

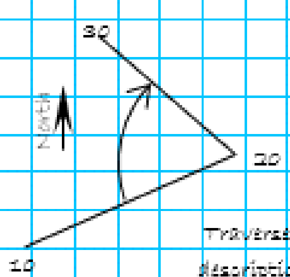
Sunny, clear, 60°, 39.75" Hg

Total sta: Herb Adams — Total Sta Sokkia SET62

Notes: Spyder Lavinski — SN 656112

Refl: Arnot Beswick — Refl #8

Sketch:



Traverse sketch and point descriptions are on page 3.

Temp & press were entered in inst --> ppm = +1.6

Apr 01, 2016

http://www.jerrymahun.com/index.php/home/open-access/ii-measurment-documentation/66-meas-doc-e

Example Field Notes (Topographical Survey)

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Topographic Survey

TSI at pt 50, HI=5.65 ft
BSpt60, HR=5.65 ft

Pt ID	Comment
1001	start
1005	Code should be LPL
1011	HR should be 7.85 for this shot only
1014	TRE 12" Oak
1025	N sidewalk edge
1031	S sidewalk edge
1035	Fi hyd- do not use for topo
	Check BS after 1035
1039	TRC- 8" Red Pine
1041	OTH swing
1044	depression
1048	Code should be SPT
1052	TRE 10" Walnut
1054	Finish

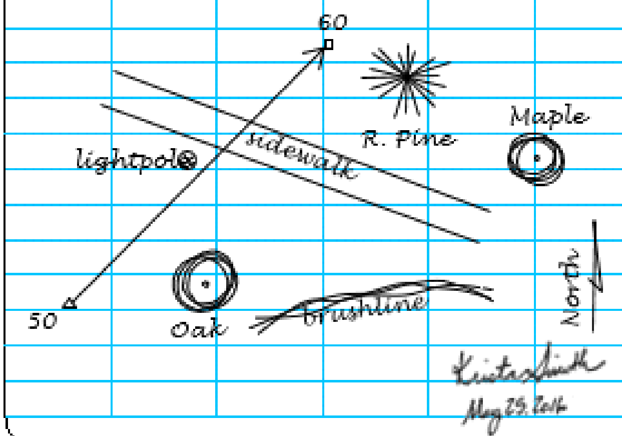
Topographic Survey

10

Date: May 25, 2016
Weather: Sunny, clear, 60, 29.75" hg
Temp & Press were set in TSI → ppm = +2.6

Crew: TSI - Jerry Keyers   Total Sta: SET62, 119
Notes - Krista Smith   Reflector #8
Rod - Craig Delaney

Files: Coordinates R9C
Measurements R9M
Sketch



Example Field Notes (Leveling)

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(12)

Three Wire Leveling

Point	BS (+)	Stadia	FS (-)	Stadia	Elev
BM Wolf					100.000
t	~~5.03~~ 5.25		2.61		+4.753
m	4.75	0.50	2.10	0.51	
b	4.26	0.49	1.60	0.50	104.753
Avg	4.753	0.99	2.103	1.01	
		99.0		101	- 2.103
TP 1					102.650
t	9.95		7.80		+9.337
m	9.34	0.61	7.21	0.59	
b	8.72	0.62	6.61	0.60	111.987
Avg	9.337	1.23	7.207	1.19	
		123		119	- 7.207
B					104.780
Sums	14.090		9.310		
Page Check					
	Start	100.000			
	Σ(BS)	+14.090			
		114.090			
	Σ(FS)	-9.310			
	End	104.780 ✓			

Three Wire Leveling

(12)

Date: Oct 18, 2017

Weather: Sunny, clear, 60 °, no breeze

Crew: Alice Deranne — Berger Tilting Level

Steve Fratoni — S/N ML 1352

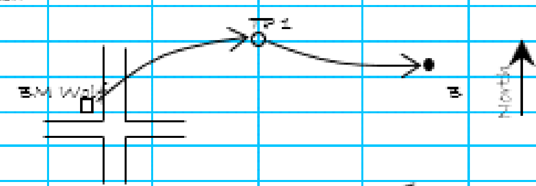
Ned Biemann — Level rod S/N 26825

Berger Level stadia multiplier is 100.

BM Wolf is a 3/4" rebar, flush, at NW intersection of Maple and Jones Streets.; elev = 895.63 ft

Point B is described on page 2.

Sketch



Steve Fratoni

Oct 28, 2017

Example Field Notes (Horizontal Curve)

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(14) Radial Curve Stakeout

Station	Deflection Angle	Radial Chord
EC 28+85.855	39°09' 00"	401.93
28+00	31°25' 13"	331.90
27+00	22°25' 13"	242.83
26+00	13°25' 13"	147.78
25+00	4°25' 13"	49.10
BC 24+50.855	0°00' 00"	0.000

Curve Components

R = 318.31	T = 259.14
L = 435.00	LC = 401.932
E = 92.15	M = 71.462

defl rate = 00°05' 24"/ft

Radial Curve Stakeout (14)

Stake out date: Aug 7, 2017

Weather: Partly Cloudy, 85°, Press: 30.03" Hg

Equipment

Sokkia SET4 Total Station #8, Reflector #3

Crew

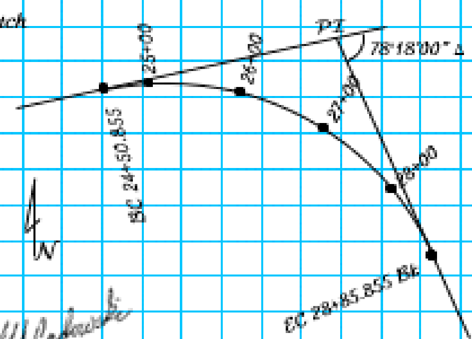
TSI/Notes: H. A. Cadowski

Rod: D.E. Lawrence

The curve was staked from the BC using the PI as the BS.

See page 15 for PI description and tie notes.

Sketch



H A Cadowski
Aug 7 2017

Example Field Notes (Pipeline Stakeout)

Monday, March 2, 2020 9:39 AM

(16)

Sanitary Sewer Stakeout

TSI HI HR: BM Elev: 875.05

TSI Elev

Line	Offset	Station	Stake Elev	Grade Elev	Cut/ Fill
SS 01		HR:			
	MH#22	--			
	15' L	0+00		868.24	
12" RCP		0+25		868.34	
140' @		0+50		868.44	
0.40%		0+75		868.54	
		1+00		868.64	
		1+25		868.74	
		1+40		868.80	
	MH#21	--			

Sanitary Sewer Stakeout

(16)

Date:

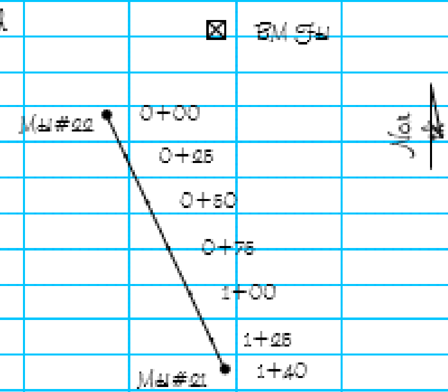
Weather

Total Station:

Crew:

BM Elev is the top nut of the fire hydrant at NE corner of Johnson and Daytona Street intersection. Elev = 875.05 ft.

Sketch



Example - Conversion

Monday, March 2, 2020 9:39 AM

10' 2 1/4"

10' 2 3/32 to 10' 2 5/32

32*12=384
3/384=0.0078
384/3=128
128/384=0.333

10+2/12+1/4/12=10.1875

Or 10.188

Blank

Monday, March 2, 2020 9:39 AM