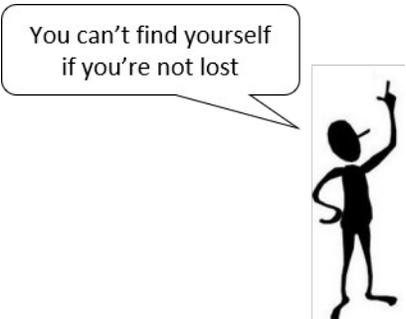


PLSS Lost Corner Re-establishment

NW Chapter WSLs CE Seminar

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I. Overview

A. General Observations; Statutory Provisions

Creative as Wisconsin's history is (after all, we are the home of Tail gunner Joe McCarthy as well as the Republican Party), PLSS corner re-establishment, as well as Section subdivision, are to be in accordance with Federal rules and methods, Wis Stat Sec 59.73(2):

Subdividing sections. Whenever a surveyor is required to subdivide a Section or smaller subdivision of land established by the United States survey, the surveyor shall proceed according to the statutes of the United States and the rules and regulations made by the secretary of the interior in conformity to the federal statutes. While so engaged a surveyor and the surveyor's assistants shall not be liable as a trespasser and shall be liable only for any actual damage done to land or property.

The cited rules and regulations are the *Manual of Instructions*, which is currently the 2009 edition. Except for some corner condition definition refinement, re-establishment and Section subdivision has not changed substantially between the 1973 and 2009 Manual editions.

There are a few notable cases where Wis procedures differ from *Manual* procedures including those of corner re-establishment.

B. Original plat and field notes; Instructions

Original notes, plats, and instructions for PLSS surveys in Wis are at the Board of Commissioners of Public Lands Office (BCPL) in Madison, WI.

BCPL has scanned original PLSS Township plats and notes and made them available online. Check their site at <http://digicoll.library.wisc.edu/SurveyNotes/>

1. Notes

Notes are important because they include information on original accessories as well as other evidence for a corner location.

Figure 2 is a copy of original notes for running the line north between Sections 17 & 18 in T43N R6E. Note line trees at 24.40 & 56.00 ch and bearing trees at Quarter and Section corners. Bearing trees, and other accessories set by the surveyor at corner establishment, are considered part of the original monument.

Township 43 North
North between Sections
17 & 18
Variations 6°15' East
24.40 Sugar 10 inches
40.00 Set 1/4 Section Post
Birch 10 ft 43 to 17
Sugar 9 ft 27 to 13
56.00 Hamlock 14 inches
80.00 Set post corner to
Sections 7, 8, 17 & 18
Sugar 12 ft 20 to 30
" 10 ft 10 to 23
Surface marking
Soil 2nd rate
Timber Hamlock,
Birch & Sugar
Undergrowth Cedar &
Sugar

Figure 1
Original Notes

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2. Plats

Similarly, plats depict the information in graphic form. Because plats are derived from notes, information on a plat would yield if it is conflict with the notes. Plats can also depict information in the Section interiors such as meandered waterways, existing claims, tree cover, wetlands, etc.

Original Township plats and patents are available online at the Bureau of Land Management's (BLM) *Government Land Office* (GLO) website: <http://www.gloreCORDS.blm.gov/>. However, there's an original and there's a copy. I was comparing two Township plats, one from the BCPL and one from the BLM, and discovered some differences. I contacted the BLM for clarification.

Question to BLM: "I notice there are differences between the Township plat on the Commissioner's website and that on your web. Specifically, I'm looking at Town 08 N Range 10 E, 4th PM, Dane Co, Wis. Which plat is considered the original plat, yours or that at the Commissioner's? It was my understanding that upon statehood, PLSS records were turned over to the states so I assumed the Commissioner's records are the originals."

BLM response: "This does get confusing. The plat copies are Original, Duplicate, and Triplicate. The Original plats went to the states, BLM retains the Duplicates, and the Triplicates are located at the National Archive. The term you see on the website (Original) is the type of survey."

The BCPL plats are the true originals while BLM and the Nationals Archives have copies. If there's a difference between the original and a copy, the copy would yield to the original. It is, however, a good idea to download the BLM copy to use along with the BCPL version. The BCPL copies were created in the early days of scanning technology and some are hard to interpret. BLM copies are generally clearer and many used colored line work.

3. Original Instructions

Instructions identify proscribed procedures, monumentation & marking, note forms, accuracies, etc. These were in the normally issued Instructions as well as Special Instructions. Both are available through the BCPL although not online - these require a personal visit or a written copy request.

Individual *Manuals of Instruction* from 1851 through 2009 editions are online in pdf form at the BLM *Cadastral Survey Historic Manuals and Handbooks* website¹. An excellent source of the major aspects of all PLSS instructions in a single volume is C.A. White's book *A History of the Rectangular Survey System*. Its nearly 800 pages contain excerpts from Instructions along with sample notes, diagrams, and summaries up through the *1973 Manual*. It also covers the colonial land tenure systems that lead to the development of the PLSS, gives a detailed explanation of the actual Seven Ranges surveys, and describes the nature of the individuals who drove the PLSS evolution. Out of print and expensive if you can find it, a pdf version is available at the same BLM *Manuals* site.

¹<https://www.ntc.blm.gov/krc/legacy/course/538>

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4. A Package Deal

Why bother getting notes for something that was done over 150 years ago? Everything has changed and we have more accurate equipment so what's the relevancy?

The resurvey of today is trying to recreate that 150+ year old survey. The notes give us insight into what was done to create the cadastral framework on which all subsequent surveys are based. Although Instructions were issued, a number of requirements, such as monument marking, closing corner placement, etc, changed over sometimes short periods of time. Extraordinary circumstances may have required separate *Special Instructions* which deviated from the norm (eg, placement of Wisconsin's northernmost Correction Line). Terrain conditions, particularly in water infused areas, may have required the surveyor devise ways that still met the spirit of the PLSS by using a variation of standard procedures.

The notes and plat are written record of what the surveyor did and how. Some lost corner re-establishment methods are predicated on the original surveyor following the Instructions as issued. Procedural deviation may necessitate a different methodology which better reflects original intent. After all, ours is not to place a corner where it should have been but to recreate its position as defined by the original surveyor. In the Closing Corners section we'll briefly examine such a situation and see if it affects lost corner restoration methodology.

Even with a copy of the notes, plats, and Instructions, it may not be readily apparent how the surveyor actually performed the fieldwork. How did he know when his northbound line intersected a Correction Line? How did he run a true line of latitude? To better understand PLSS evolution and application in Wisconsin, each surveyor should have these two Wisconsin-specific PLSS reference books on his/her shelf within arm's reach:

A Manual for the Resurvey of Public Land Corners and Sensationalized Subdivision Boundaries within the State of Wisconsin, Onsrud. This is the PLSS reference for Wisconsin. It includes summary of primary Instructions with their monumentation, specified marking, measuring methodology, and discussion of probable field methods employed. Appendices contain State maps showing the surveyors and dates of Township and Section surveys.

General Instructions and State Laws Governing the Original Government Survey of Wisconsin, Prague. This book goes into greater detail on applicable Instructions and also includes Wis Statute law which affected original PLSS surveys and subsequent Section Subdivision.

Both of these are available for purchase at the WSLs website.

5. Monument Records

We may not be the first surveyor determining a particular PLSS corner location. Other surveyors before us may have re-established the corner and filed a Monument Record at the County. That record is a part of the corner's evidence chain. The record should include sufficient information to determine why the surveyor re-established the corner where he/she did. Some did a better job of that than others.

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The monument records are filed in the County Surveyor's office or the office designated to retain such records. Generally all records are retained and not replaced as new ones are created. This serves as the written history of a corner's position over time and must also be considered when re-establishing a corner. Some Counties have their latest monument records online. The *Survey Control Finder* application on the State Cartographer's Office website ([HTTP://maps.sco.wisc.edu](http://maps.sco.wisc.edu)) has a PLSS Monument Record layer. It connects to records directly or through a County's GIS.

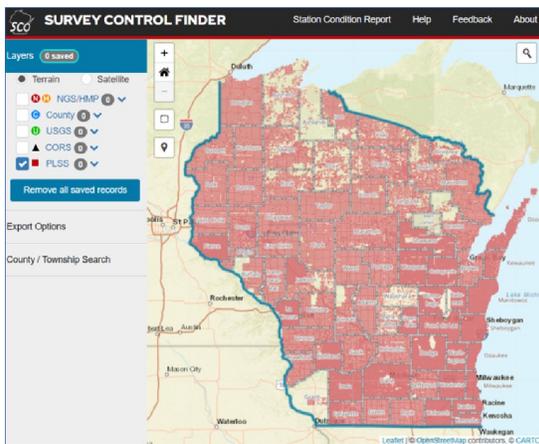


Figure 2
Survey Control Finder - PLSS

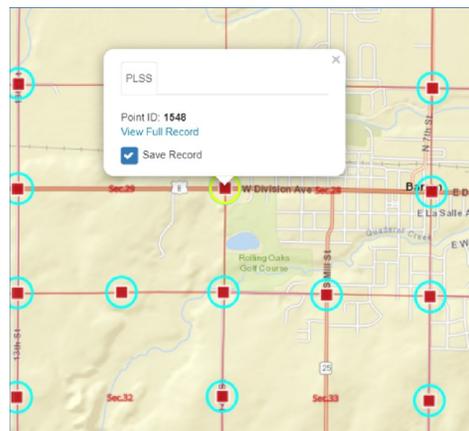


Figure 3
Survey Control Finder Records

C. Corner Disposition

The amount and quality of evidence determine a corner's disposition: it may be existent, obliterated, or lost.

1. Definitions

According to the *1973 Manual* the three corner conditions are defined as:

5-5. An existent corner is one whose position can be identified by verifying the evidence of the monument or its accessories, by reference to the description in the field notes, or located by an acceptable supplemental survey record, some physical evidence, or testimony. Even though its physical evidence may have entirely disappeared, a corner will not be regarded as lost if its position can be recovered through the testimony of one or more witnesses who have a dependable knowledge of the original location.

5-9. An obliterated corner is one at whose point there are no remaining traces of the monument or its accessories, but whose location has been perpetuated, or the point for which may be recovered beyond reasonable doubt by the acts and testimony of the interested landowners, competent surveyors, other qualified local authorities, or witnesses, or by some acceptable record evidence.

A position that depends upon the use of collateral evidence can be accepted only as duly supported, generally through proper relation to known corners, and agreement with the field notes regarding distances to natural objects, stream crossings, line trees, and off-line tree blazes, etc., or unquestionable testimony.

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5-20. A lost corner is a point of a survey whose position cannot be determined, beyond reasonable doubt, either from traces of the original marks or from acceptable evidence or testimony that bears upon the original position, and whose location can be restored only by reference to one or more interdependent corners.

The *2009 Manual* definitions are:

6-11. An existent corner is one whose original position can be identified by substantial evidence of the monument or its accessories, by reference to the description in the field notes, or located by an acceptable supplemental survey record, some physical evidence, or reliable testimony.

A corner is existent (or found) if such conclusion is supported by substantial evidence. The substantial evidence standard of proof is such relevant evidence as a reasonable mind might accept as adequate to support a conclusion. Substantial evidence is more than a scintilla of evidence but less than a preponderance of the evidence.

6-17. An obliterated corner is an existent corner where, at the corner's original position, there are no remaining traces of the monument or its accessories but whose position has been perpetuated, or the point for which may be recovered, by substantial evidence from the acts or reliable testimony of the interested landowners, competent surveyors, other qualified local authorities, or witnesses, or by some acceptable record evidence.

7-2. A lost corner is one whose original position cannot be determined by substantial evidence, either from traces of the original marks or from acceptable evidence or reliable testimony that bears upon the original position, and whose location can be restored only by reference to one or more interdependent corners.

The surveyor will notice that the 2009 version expressly states that an obliterated corner is an existent corner. A more subtle difference is the 2009 versions do not include "beyond a reasonable doubt" in either obliterated or lost corner definitions.

These corner conditions sound simple enough, but in practice they may be hard to distinguish with quite a bit of gray area in between. The difference between existent or obliterated, and obliterated or lost may be the degree of evidence discovered. Is soil discoloration remains of the original corner post or one of its witnesses? If so, then it might be an existent corner, if not it may be obliterated or lost depending on other evidence.



Figure 4
Soil Discoloration

The role of evidence in re-establishing PLSS corners is no different from that in re-establishing any other legal corner. We still collect evidence, evaluate it using the Rules of Construction as a framework, and look for a "preponderance" indicating the most likely location of the original corner.

A single corner cannot be existent for one surveyor and lost for a second. Those are opinions based on the evidence each surveyor considers. Either both are not considering the same evidence or they weigh the same evidence differently. Corner disposition is independent of the surveyor;

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disposition is defined by evidence. At any given time, a corner's disposition is only one of the three conditions. It's the surveyor's challenge to collect all pertinent evidence and weigh it accordingly in order to discover the true corner disposition.

D. Lost Corner Restoration Methods

1. Introduction

It is important to understand what a lost corner really is. A lost corner means there is no credible evidence of an original corner location. Or if there is evidence, it is so weak or contradictory that the original position cannot be located with any degree of certainty. A lost corner must be re-established by relating contemporary measurements to record values between surrounding existent, or otherwise re-established, original corner locations. The resulting position is dependent on the disposition quality of surrounding corners and the original surveyor's records.

Corner re-establishment attempts to set a monument in the same location as the original surveyor. Although the intent of the PLSS was to introduce consistency in procedures and effect, that was nearly impossible from the onset. Across terrain that varied from flat and treeless to rugged and nearly impassible, heavily forested to pockmarked with water bodies, let alone the conditions they labored under, original surveyors encountered unique situations requiring deviation from the Instructions and/or creative implementation of them. Over time, lost corner restoration methods evolved to better address those conditions while attempting to stay true the PLSS intent.

2. Restoration Methods

The *2009 Manual* divides restoration methods into *Primary* and *Secondary Methods*. Because of corner dependencies, order of establishment, etc, there can be overlap between the methods and even using combinations of them.

a. Primary; *Manual* page 166

Double Proportionate Measurement (DPM)	Sec 7-8
Single Proportionate Measurement (SPM)	Sec 7-16
3 Point Control (3PC)	Sec 7-13
2 Point Control (2PC)	Sec 7-14
Modified SPM (MSPM)	Sec 7-44

b. Secondary Methods; *Manual* page 173

Irregular Boundary Adjustment (IRR)	Sec 7-51
Grant Boundary (GB)	Sec 7-54
One Point Control (1PC)	Sec 7.58
Mixed & Miscellaneous	Sec 7-58 & 59

In addition to the restoration methods an Index Correction may need to be considered.

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3. Line Hierarchy

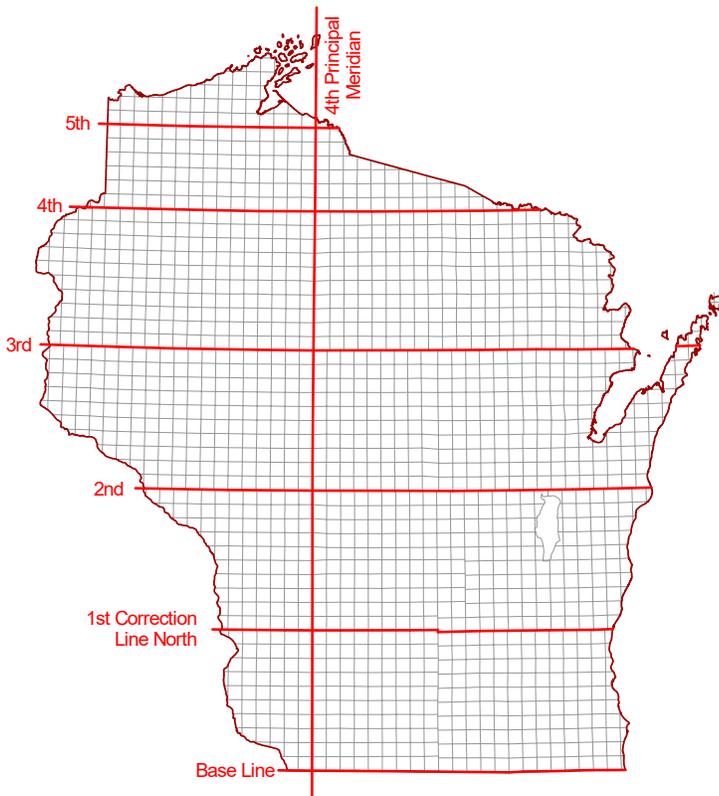


Figure 5
Wisconsin PLSS to Township Level

The PLSS framework was built in parts, although not in the perfect order described in the Instructions. The order of line establishment defines their senior standing or higher relative weight where they intersect other lines.

The general order is:

- Principal Meridian and Base Line
- Correction lines
- Township lines
- Section Lines

When a lost corner is at the intersection of two unequally weight lines, its restoration is controlled by the senior line

We'll see when we discuss the different methods that in some cases direction controls over distance while in others distance controls over direction. These are a result of line hierarchy.

4. It's a Guess at Best

There is no guarantee that a lost corner re-established by any method will be in the original location. It is the best location we can arrive at based solely on record and contemporary measurements.

Although lost corner methods are considered a last resort they can be used as another piece of evidence to support an obliterated corner location. In that case they serve strictly in a secondary role.

II. What Once Was Lost

Rather than discuss the restoration methods in the order of appearance in the Manual, we'll start with the simpler and more familiar Primary Methods and work our way through those rest. Not all are applicable in Wisconsin so we will cover those which are.

The basic rules for lost PLSS corners re-establishment are the same as those used for a subdivision lot resurvey:

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- One or more accepted original corner locations are needed to re-establish a lost corner.
- Original corners cannot be disturbed.
- Any discrepancies between original corner positions must be managed between those positions and cannot extend beyond them.

The primary difference between PLSS and other lost corner re-establishment methods is that PLSS methods are defined in the *Manual* so are consistent (for the most part) across jurisdictions. Non-PLSS restoration uses the Rules of Construction for guidance and relies heavily on common law which can vary state-by-state.

A. There's North and Then There's North

1. PLSS Direction Reference

PLSS Instructions required original surveyors record directions referenced to True North, despite the fact that early surveyors used magnetic compasses. Astronomic observations were made to determine the True Meridian which could then be measured with a compass to determine the magnetic variation¹. This became much easier and more accurate after William Burt developed his solar compass.

To re-establish lost corners often requires referencing contemporary directions to the True Meridian. To convert grid directions to True, Figure 6, the following equation is used:

$$\text{Grid Az} = \text{True Az} - \gamma$$

γ : convergence

Convergence varies E/W in a grid system. How to get it?

NGS' online *NCAT*² software can be used to determine convergence for State Plane Coordinate (SPC) or Universal Transverse Mercator (UTM) systems.

NCAT does not support Wisconsin County Coordinate or the Wisconsin Transverse Mercator (WTM) Systems. GIS or some mapping software that include Wisconsin-specific systems may be able to generate convergence.

Two different free coordinate conversion tools for all formal Wisconsin systems (SPC, UTM, WTM, County, and Geodetic) are available in the *Software* section at [HTTP://jerrymahun.com](http://jerrymahun.com)³:

Wis83CoordConv1-5.xlsm is an *Excel* workbook for single point conversion.

ConCoord is a Freeware software package able to perform interactive point-by-point or point file conversions.

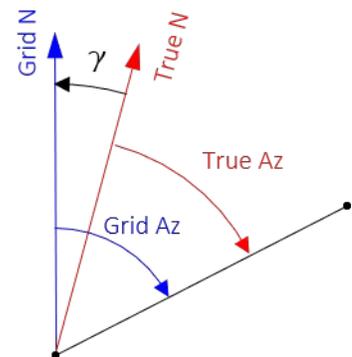


Figure 6: Grid & True Relationship

¹*Declination* is the contemporary term for the angle from True to Magnetic North and *variation* is its rate of change. The PLSS Instructions use *variation* instead of *declination*. We'll use the PLSS term.

²<https://www.ngs.noaa.gov/NCAT/>

³<https://jerrymahun.com/index.php/home/software/218-coordinate-conversion>

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Do not use an assumed direction system for any re-establishment applications: an assumed system has no connection to the True Meridian.

2. Cardinal Equivalents

Many corner re-establishment procedures requires converting a line's distance and direction into its N/S and E/W components. These are its *cardinal equivalents*, Figure 7.

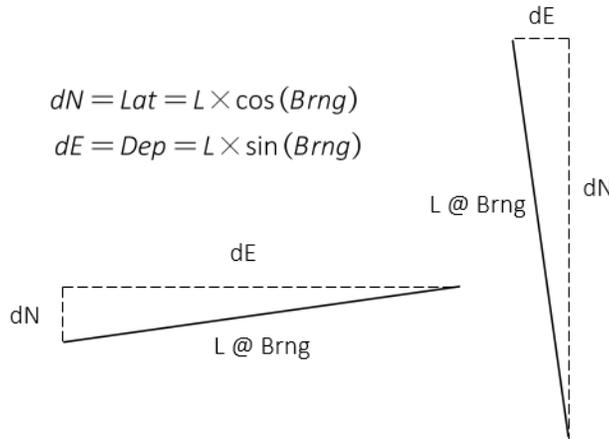


Figure 7: Cardinal Equivalents

Cardinal equivalents are needed for record and contemporary measurements and must be computed with respect to True North. Unless otherwise indicated in original documentation record directions are already True and so the distances are cardinal¹. If a resurveyed line between accepted corners deviates from a cardinal direction, it must be reduced to its cardinal components before corner re-establishment.

B. Proportionate Measurement Techniques

1. General

Proportionate measurement relates current and record measurements in a ratio between accepted original corners. Because PLSS lines were intended to run N/S and E/S, proportioning follows the same pattern using cardinal equivalents.

Sections in a Township were created simultaneously when the plat and notes were accepted on behalf of the Government. As with any simultaneous boundary creation method, all created lines have equal standing (no senior-junior rights) so excess or deficiency is prorated (proportioned) across the affected lines.

Proportionate measurement is imperfect. The original surveyor had specific distance and direction

¹Up through the completion of the PLSS in Wis surveyors were required to record the compass variation for each Section line in the notes and on the plat. Because lines were to be run in True directions their cardinal equivalents would be the distances as recorded in the notes and on the plat with no further computations necessary.

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criteria to follow; proportionate measurement, however, may favor distance over direction or vice versa depending on the corner. Lost corners are re-established using original distance intent which can substantially alter line directions from that originally intended.

Proportionate measurement must be applied between accepted original positions generally to the sides of the lost corner position. There must be a dependency between the lost corner and the adjacent corner(s) between which the proportion will be applied. That's because, as with any corner re-establishment, the contemporary surveyor attempts to recreate the original situation.

Take for example Sections in two adjacent Townships, Figure 8.

The S1/4 corner of Sec 7 T3N R10W is lost (✗). The SW corner of Sec 12 T3N R11W and the SE corner of Sec 7 T3N R10W are original corner positions (●). Although SE cor Sec 7 can be used to re-establish the S1/4 cor, the SW cor Sec 12 cannot because it is in a different Township. There is no original direct connection between those two corners - they were created independently of each other.

Remember, each Township is its own simultaneously created system. You wouldn't directly use a lot corner in an adjacent subdivision to prorate a lost lot corner in a different subdivision; the PLSS is the same way.

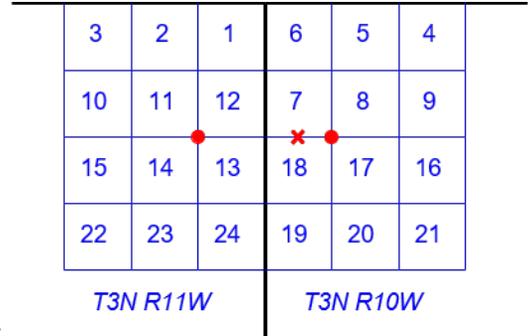


Figure 8: Lost Corner Situation

2. Primary Proportioning Methods

There are two proportionate measurement methods depending on the hierarchy of the lines intersecting at a corner: Single or Double Proportionate Measurement.

a. Single Proportionate Measurement (SPM)

SPM is used to re-establish one or more corners along a single line. Where a corner falls at the intersection of two unequal lines, SPM is used along the higher weighted line.

Once the controlling corners are recovered and measurements made between them the SPM process to re-establish the lost corner is a four-step process:

- (1) Compute appropriate record cardinal equivalents (as appropriate)
- (2) Compute measured cardinal equivalents
- (3) Set up and solve new cardinal proportion
- (4) Use new cardinal proportion to determine lost corner location

The simplest example of SPM is re-establishing a lost quarter corner between two adjacent Section corners.

The S1/4 corner of Section 7 is lost, Figure 9. The SE and SW corners on both sides are existent. Record and measured distances and directions are shown between them.

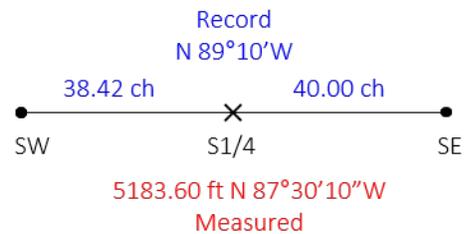


Figure 9: Ex 1 Sec 7 Lost S1/4 Corner

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Because this is an E/W SPM use Departures.

Step (1) Compute the appropriate record cardinal equivalents, Figure 12(a).

$$\text{SE-S1/4: } dE = 40.00 \times \sin(89^\circ 10') = 40.00ch$$

$$\text{SE-SW: } dE = (40.00 + 38.42) \times \sin(89^\circ 10') = 78.41ch$$

Step (2) Compute cardinal equivalent of the measured line SE-SW, Figure 12(b).

$$\text{SE-SW: } dE = 5183.60 \times \sin(87^\circ 30' 10'') = 5178.68ft$$

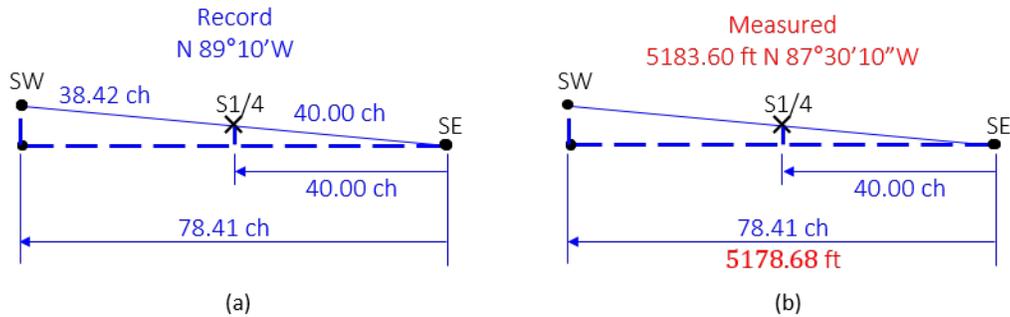


Figure 10: Ex 1 Cardinal Equivalents

Step (3) Set up and solve new cardinal proportion, Figure 11(a).

$$\text{SE-S1/4: } \frac{40.00ch}{(40.0ch + 38.42ch)} = \frac{y}{5178.68ft}$$

$$\Rightarrow y = 5178.68ft \times \left[\frac{40.00ch}{78.41ch} \right] = 2641.85ft$$

Step (4) Use new cardinal proportion to determine lost corner location, Figure 11(b).

Measure 2641.85ft West from SE corner and set temporary point.

Project North from the temporary point.

Set S/14 corner at intersection of the projected and SE-SW lines.

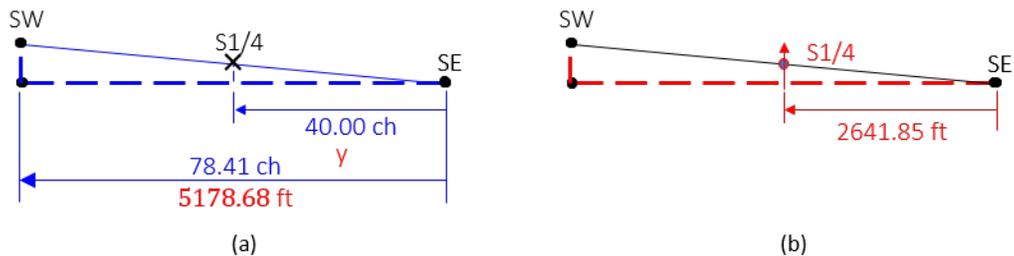


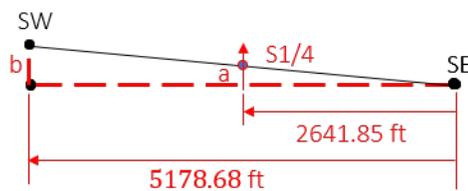
Figure 11: Ex 1 S1/4 Cardinal Equivalent

How do you now when you intersect the two invisible lines? You can compute the

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offset from the temporary point, Figure 12.

Compute b , the Latitude of the measured distance; then a , the offset, using a ratio.



$$b = Lat = 5183.60 \times \cos(87^\circ 30' 10'') = 225.85 \text{ ft}$$

$$\frac{a}{225.85} = \frac{2641.85}{5178.68}$$

$$\Rightarrow a = 225.85 \times \left[\frac{2641.85}{5178.68} \right] = 115.22 \text{ ft}$$

Figure 12: Ex 1 Offset

Set the S1/4 corner 115.22 ft North from the temporary point.

SPM maintains the correct proportional distance along the record direction between the two controlling corners.

b. Double Proportionate Measurement (DPM)

DPM is used to re-establish a lost corner located at the intersection of two equal weight lines. The location is not biased in one direction over the other.

The DPM process, Figure 13, is:

- (a) SPM N/S and set one temporary point
- (b) SPM E/W and set a second temporary point
- (c) The lost corner is located at the intersection of an E/W line through the first point and an N/S line through the second.

The N/S & E/W order can be reversed.

Lines through the temporary points are run in True directions. Numerically, this would be a direction-direction intersection.

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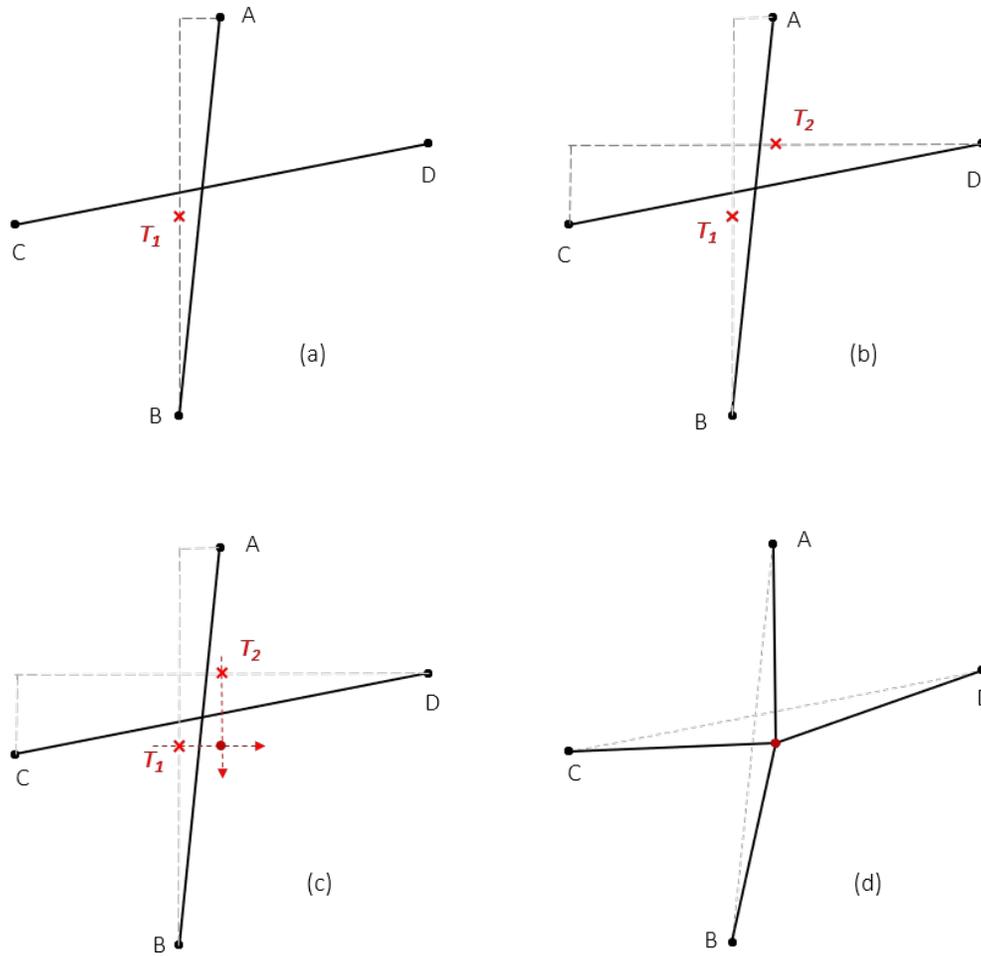


Figure 13: DPM Procedure

DPM prioritizes distance over direction, Figure 13(d), to re-establish the lost corner. As a result:

there is no guarantee the corner will be online in either N/S or E/W directions as was originally intended.

the final distances are no longer in the original proportions.

A point that may have originally been online and halfway between the two controlling points may be no longer meet those conditions. This is one reason lost corner methods are used as a last resort.

C. Proportionate Concerns

There are two primary concerns using proportioning to re-establish a lost corner:

Record

The former is a critical question because it can have a profound effect on the final restored corner location. Consider the situation in Figure 14.

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Re-establish...

(1) S1/4 cor Sec 1

Single line; controlling points are SE and SW corners of Sec 1

SPM between them. Piece of cake.

(2) W1/4 cor Sec 13

Single line; what are the controlling points?
W1/4 cor Sec 12 and SW cor Sec 13?

W1/4 cor Sec 13 wasn't set based on W1/4 cor Sec 12. It was at midpoint of NW and SW cors of Sec 13.

Must re-establish NW cor Sec 13 first.

... NW cor Sec 13

Intersection of two equal weight Section lines; use DPM.

Controlling points

N/S - W1/4 cor Sec 12 and SW cor Sec 13? Yup.

E/W - S1/4 Sec 7 and S1/4 cor Sec 11? Nope. Sec 7 is in a different township.

Control at east end E/W line is SE cor Sec 12.

Must re-establish SE cor Sec 12 first.

... SE cor Sec 12

Intersection of two unequal weight lines: Section E/W and Township N/S.

Re-establish using SPM along Township line.

Control? E1/4 cor Sec 14 and SE cor Sec 13.

The order of corner re-establishment, control points, and method are summarized in Figure 15.

In the process of re-establishing W1/4 cor Sec 13, two other corners were re-established.

While we're at it, how about re-establishing the N1/4 and E1/4 corners of Section 13?

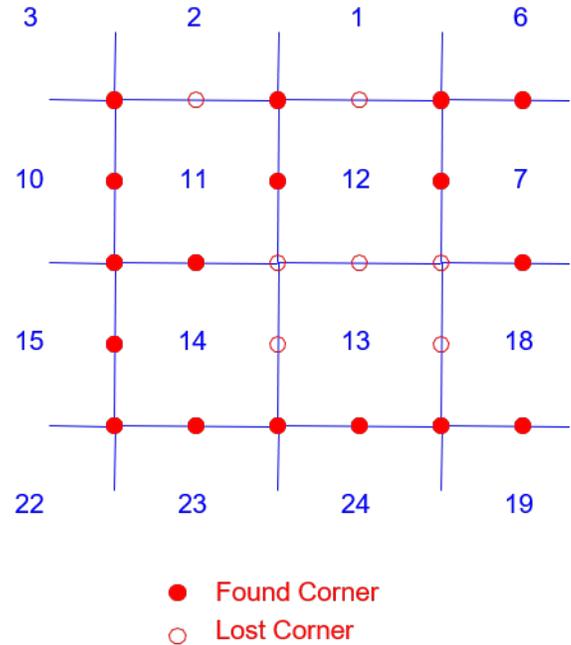


Figure 14: Corner Situation

PLSS Lost Corner Re-establishment

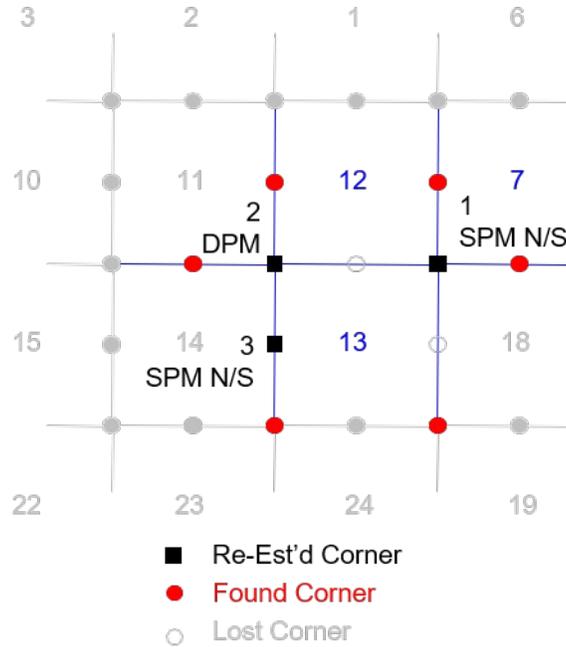


Figure 15: Re-Establishing W1/4 Corner Sec 13

d. Modified SPM

In some cases a Section line was intentionally bent at an intermediate corner so the line between bounding Section corners was not a constant bearing.

Original surveys did not start at an Initial Point and progressively survey north systematically creating Sections. Where industry expanded or populations settled created the highest surveys priority. Surveys sometimes had to “meet in the middle” which could cause Section line mismatching.

One possible situation was in the interior of a Township partially divided by two different surveyors. In normal Township subdivision, random lines were run to the east or west to close on an existing Section corner setting a temporary quarter corner. If the closure was acceptable, the temporary quarter corner would be corrected back to the true line. Random lines were not typically run to the north so a second surveyor might bend the line at the quarter corner to meet the first surveyor’s Section corner.

For MSPM, the procedure attempts to recreate the bent aspect of the line segments. That means unlike SPM where the corner is re-established online between controlling corners, the lost corner is re-established the same side of the line between controlling corners.

Figure 17(a) shows the record dimensions for the east line of Section 15¹.

¹The directions deviate considerably from North in this example to better demonstrate the calculations involved in MSPM.

PLSS Lost Corner Re-establishment

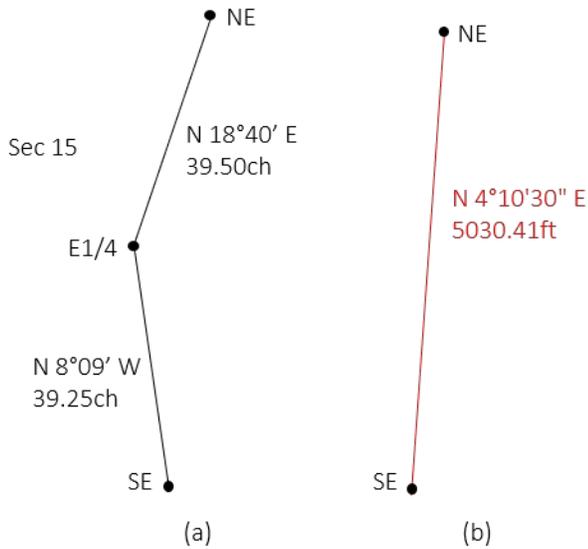


Figure 16: MSPM Record and Measured Values

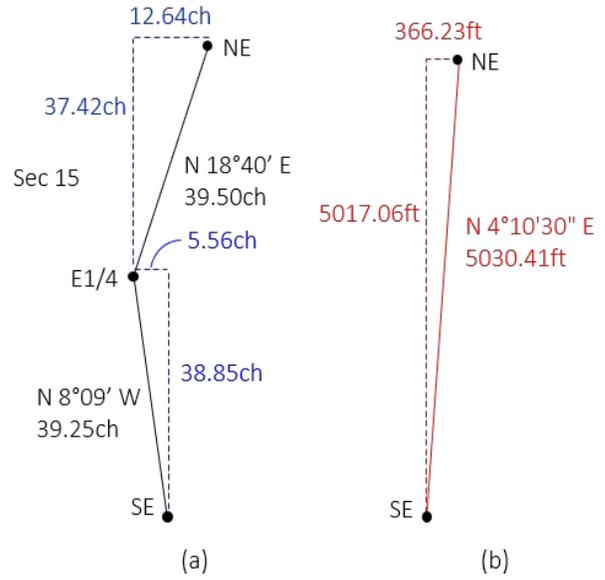


Figure 17: MSPM Cardinal Equivalents

Section 15's NE and SE corners are found while its E1/4 corner is lost. Figure 16(b) shows the contemporary measurements between the found corners.

The cardinal equivalents for both sets of values are shown in Figure 17.

To determine the lost corner's location:

Compute the proportioned distance north of the SE corner, Figure 18.

$$\frac{n}{5017.06ft} = \frac{38.85ch}{(38.85ch + 39.50ch)}$$

$$\Rightarrow n = 5017.06 \times \left[\frac{38.85ch}{(38.85ch + 39.50ch)} \right]$$

$$n = 2487.72ft$$

Set a temporary point 2487.72ft north of the SE corner.

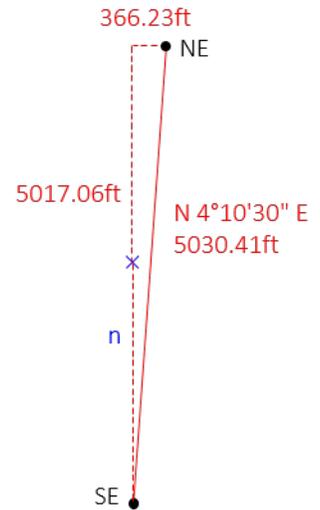


Figure 18: MSPM N/S Proportion

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The lost corner must be offset west from the line connecting the SE and NE corners, Figure 19.

Compute the offset

$$\frac{w}{2487.72ft} = \frac{5.56ch}{38.85ch}$$

$$\Rightarrow w = 2487.72ft \times \left[\frac{5.56ch}{38.85ch} \right]$$

$$w = 356.03ft$$

The lost corner is set 356.03ft west from the SE-NE line through the temporary point, Figure 20..

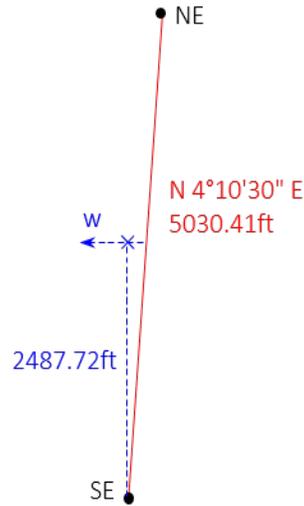


Figure 19: MSPM E/W Offset

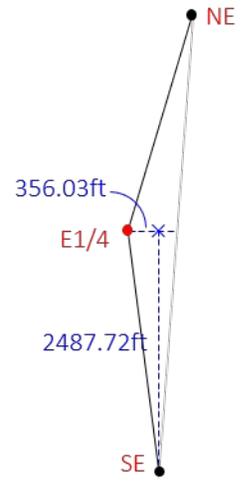


Figure 20: MSPM E1/4 Corner

How often would one encounter an MSPM lost corner situation? A line can deflect at a witness or meander corner; we'll look at those later. It could also happen on a line that, although shown as straight on the plat, in reality isn't. From Section 7-34 of the *2009 Instructions*:

"There may be persuasive proof of a deflection in the alinement of the exterior, though the record shows the line to be straight...This condition, when supported by substantial evidence, would warrant an exception to the straight-line or two-way adjustment because under the rules for the acceptance of evidence, the evidence out-weighs the record."

This could happen where a navigable water body was so large causing the surveyor traverse around it to continue the line. An error in the traverse could cause a misalignment in the Section line although it would be shown on the plat as the same bearing.

3. Index Correction

The 2009 Manual describes an *Index Correction* in Sections 7.15 and 7-57 with the latter providing a clearer definition:

"In cases where a retracement has been made of many miles of the original lines, between identified original corners, and there has been developed a definite and consistent surplus or deficiency in distance, or a definite and consistent angle from cardinal that characterizes the original survey, it is proper to make allowance for the average difference(s). Such adjustment will be incorporated automatically in all cases where there exists a suitable basis for proportional measurement."

An index correction is used to compensate an original surveyor's systematic error. This does not affect the original corner locations only the measurements connecting them. Early surveyors were required to have at least two chains - one would be used only for calibration, the other for the

PLSS Lost Corner Re-establishment

actual measurements. Chains links would wear affecting distances and the surveyor was supposed to check the working chain and adjust it as needed. If he didn't, his corners would be placed too far apart, Figure 21.

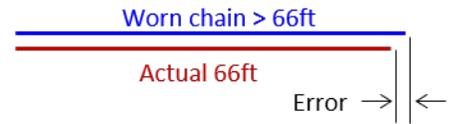


Figure 21: Chaining Error

A systematic error could also exist if the surveyor used the incorrect magnetic variation. This could be caused by errors in astronomic observations to establish direction.

When using proportional restoration methods, an index error is generally automatically compensated. They may need to be addressed in other restoration methods where there are insufficient controlling corners. Dealing with them are relatively simple, determining if they exist may not be.

C. Corner Types

1. Regular

So far we have only discussed Section and quarter Section corners. These are usually referred to as *regular* corners. Since the earliest PLSS instructions it was intended to create one mile square parcels and either monument, or provide for subsequent monumentation of, their corners and later intermediate corners. On the ground, where the world wasn't flat and clear of obstacles, other corners were needed to delineate and perpetuate the system. Some have a direct effect on lost corner re-establishment while others do not. It depends on the reasons the corners were placed and their relationship to regular corners and lines.

2. Closing Corners

a. General

Closing Corners were so named because a PLSS line was to close on a previously established line.

Lines running to the north from a Standard Parallel¹ would start at a Township or Section corner placed when the Standard Parallel was run. These are called Standard Corners (SC). Lines from the south would intersect the Standard Parallel at a Closing Corner (CC), Figure 22.

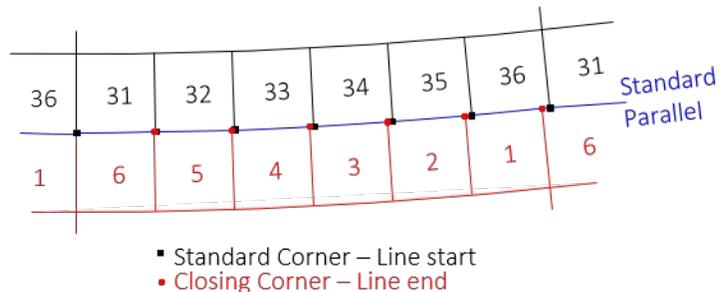


Figure 22: Closing and Standard Corners

Due to meridian convergence the CC should be on the Principal Meridian (PM) side of the SC: Under most Instructions, the surveyor was to record the distance to the corresponding SC. The combination of CC and SC on a correction line is often referred to as double-corner situation.

¹Also called a Correction Line.

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Although a CC would be theoretically to the PM side of its corresponding SC, its actual location was also affected by survey errors in the Township and Section line surveys. As a consequence, the CC could fall long or short of the respective correction line. If a CC did not intersect at a SC then the direction and distance between them would be recorded. Early in PLSS development the principle that a CC would control line direction, not termination was adopted. This was done to avoid gaps and overlaps with adjacent Townships. Consider Township lines as senior to interior Section lines: an exterior Section must end on and not cross its Township boundary (ies).

b. Closing Corners in Wisconsin

CC placement went through an evolutionary change during Wisconsin's surveys.

Tiffin's *1815 Instructions* required double corners on north and west Township lines, Figure 23¹. If the CC matched the existing SC then it became the Section corner.

The *1833 Instructions* required CC only on the north Township boundary. Figure 24.

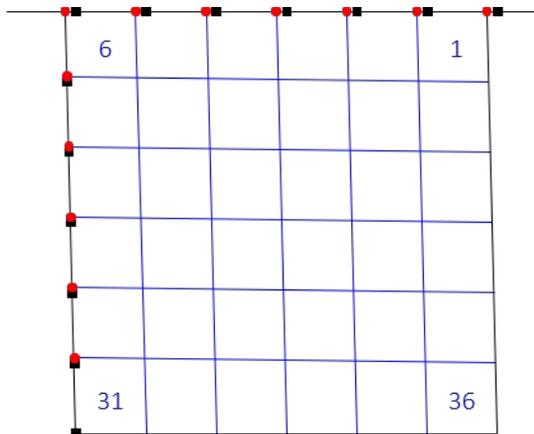


Figure 23:
Double Corners Pre-1851

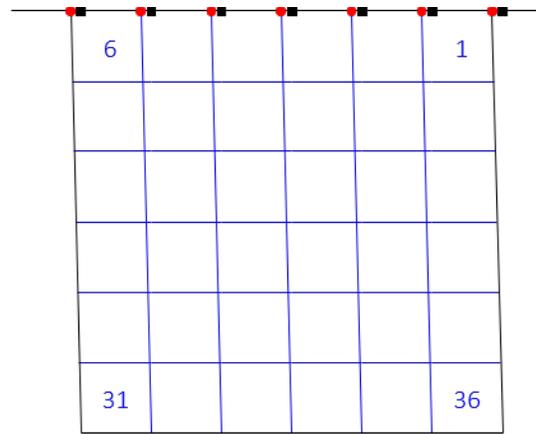


Figure 24:
Double Corners Post-1851

The 1840 Instructions required CC placement only on a Standard Parallel. For north and west Township boundaries, Section lines closed on the existing corners.

c. Corner Re-establishment and Lost Corners

Figure 25 shows some Closing and lost corner situations.

¹ The terms *Closing* and *Standard Corner* were not used until the *1851 Manual of Instructions*. Although Wisconsin surveys began in the 1830s, we will use the terms Closing Corner (CC) and Standard Corner (SC) throughout this discussion for consistency.

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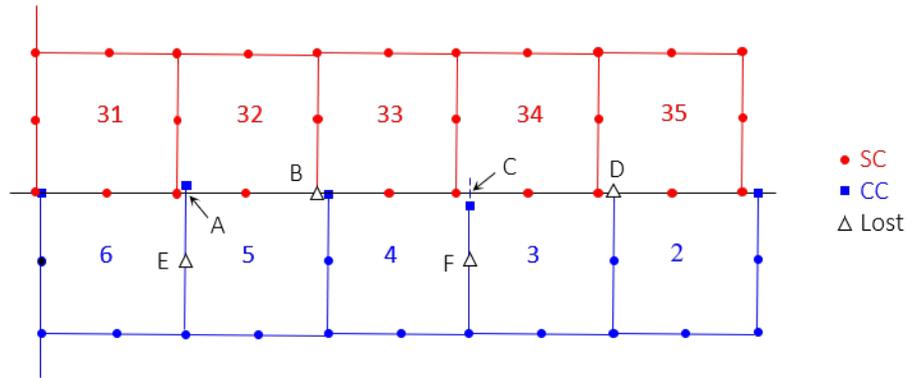


Figure 25: Closing and Lost Corners

What role does a CC have in lost corner re-establishment?

Case	Corner	Description
A	NW Sec 5	CC is north of Township line. CC controls direction of N/S Section line. Set Section corner at intersection of Township and Section lines
B	SE Sec 32	If the CC at NW Sec 4 is on the Township line then it is the Section corner and can be used as control to re-est SE Sec 32 by SPM to the SW Sec 32. If it isn't on the line, then S1/4 Sec 33 would be used.
C	NE Sec 4	CC is south of Township line. CC controls direction of N/S Section line. Set Section corner at intersection of Township line and extended Section line.
D	NE Sec 3	This is a lost CC. Re-est it as the NE Sec 3 using SPM between SW Sec 35 and S1/4 Sec 35.
E	W1/4 Sec 5	Re-est by SPM between the SW Sec 5 and the CC. Why not the re-est NE Sec 5 (A)? Because the surveyor set the CC.
F	E1/4 Sec 4	Re-est by SPM between the SE Sec 4 and the CC. Why not the re-est NE Sec 4 (C)? Because the surveyor set the CC.

3. Witness Corner

a. What is it?

A witness corner (WC) was set in situations where it was not possible to set a regular corner except when a navigable water body was involved. Generally only one WC was used and it was placed on a line into the regular corner location. Their marking and accessories requirements were the same as for a regular corner.

There are two kinds of WC based on where they were placed:

On a line leading into the regular corner, Figure 26. The distance from the previous set

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regular corner is recorded.

A WC off to the side of the line, Figure 27. This WC type serves as an accessory to the original corner.

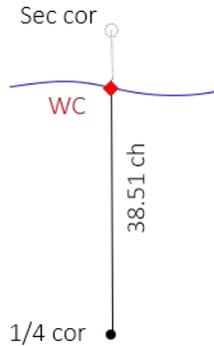


Figure 26: On Section Line

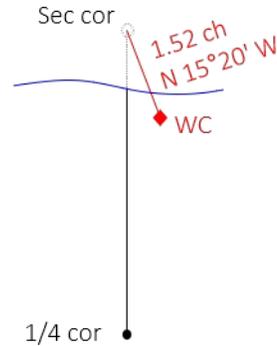


Figure 27: Off Section Line

b. Use in Corner Restoration

From Section 6.17 2009 Manual of Instructions:

"...Where the witness corner was placed on a line of the survey, if no complications arise, the witness corner will be used as control in determining the true point for the corner...."

...For corners reestablished by double proportionate measurement, the true point for the corner will be determined by extending the line through the witness corner at record distance. For corners reestablished by single proportionate measurement, the true point for the corner will be determined by single proportionate measurement between the witness corner and the opposite controlling corner. Thus, in single proportionate measurement, the record bearing and distance is modified, and the witness corner becomes an angle point of the line...."

For a WC to contribute to SPM or DPM corner re-establishment it must be the type shown in Figure 26- it must be on the line.

Since its distance is measured from the previous corner it can be used for SPM. For DPM situations, the regular corner is determined from the MC position and used as a control for one direction of DPM.

Figure 28 shows some lost corners involving an MC.

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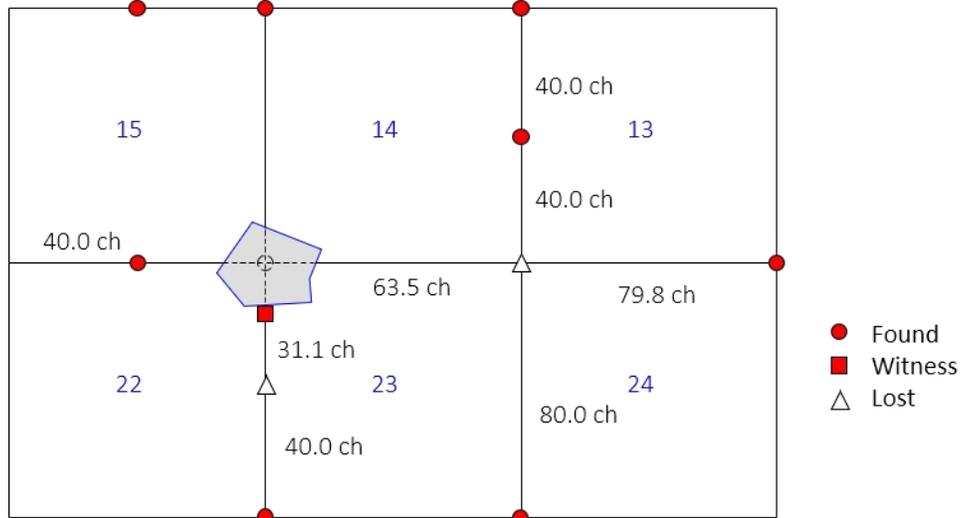


Figure 28: Witness and Lost Corners

Corner	Description
W1/4 Sec 23	The WC can be used to re-establish the lost corner by SPM between it and the SW Sec 23. The E1/4 cor would be set of the distance from the SE cor toward the MC.
NE Sec 23	The position of NW Sec 23 is computed continuing 8.9 ch past the WC along the Sec line. Re-est the NE Sec 23 by DPM using NW Sec 23 to NE Sec 24 E/W SE Sec 23 to E1/4 Sec 14 N/S

4. Meander Corners

a. Why are they set?

Meander Corners (MC) were set where a PLSS line intersected a meanderable body of water. They were also used in place of a regular corner where that corner fell in a meanderable waterway. As with WC, distance to a MC along the line was recorded; marking and accessories requirements were the same as those for a regular corner.

b. Use in Corner Restoration

Section 3-173 of the *2009 Manual*:

“Meander corners are a controlling monument on the surveyed line and shall be treated similarly to other regularly established monuments such as section or quarter-section corners and tract corners for dependent resurvey purposes”

Section 6-30 of the *2009 Manual*:

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“When recovered, meander corners normally control both alinement and proportionate measurement along the line, as any corner of first order. Meander corners not recovered will normally be reestablished (see section 7-37). Resurvey and retracement records must be examined carefully because meander corners, by instructions, have been used differently for restorations and establishments.”

According to the *Manual*, a MC is considered the same as a regular corner and controls both distance and direction just like any other existent Section or Quarter corner.

However, this is Wisconsin (remember, we once tried to outlaw margarine) so MCs are viewed differently. According to an Attorney General’s opinion 66 *Wis. Op. Atty. Gen. 261, 1977 (OAG 74-77)*:

“In accord, *Wisconsin Realty Co. v. Lull*, 177 Wis. 53, 59, 187 N.W. 978 (1922); *Wright v. Day and another*, 33 Wis. 260, 263-264 (1873).

Meander corners established by the original surveyors marked the direction of section or town lines to a meandered body of water. That is, the meander post itself usually was set a certain distance back from the water’s edge. See *Wright v. Day*, supra. The setback minimized destruction of the meander post by high water, waves and ice. Setback of meander posts is required by federal rule. *Manual*, ch. 3:117.

The true property corner is the ordinary high watermark, not the meander corner. See, *Mayer v. Grueber*, 29 Wis.2d 168, 173-175, 138 N.W.2d 197 (1965); *Diana Shooting Club v. Hustings*, 156 Wis. 261, 272, 145 N.W. 816 (1914). The meander corner only controls the direction of a line to its intersection with the water and such intersection is the property corner. The meander corner is not used as a measuring point. In *Underwood and another v. Smith and another*, 109 Wis. 334, 340, 85 N.W. 384 (1901), the court stated:

‘... the meander post is not a corner nor the meander line a boundary. The lake ... is the boundary, and not the meander line or meander post...’

In *Thunder Lake L. Co. v. Carpenter*, 184 Wis. 580, 583, 200 N.W. 302 (1924), the court stated:

‘... The so-called meander corner is not a fixed point for measurements, as are established section corners and quarter corners, but is a marker for courses...’

(Note: Meander corners and lines sometimes become property corners and lines in fraudulent surveys. *Manual*, ch. 7:77-93; *Kind v. Vilas County*, 56 Wis.2d 269, 201 N.W.2d 881 (1972); *Schultz v. Winther*, 10 Wis.2d 1, 101 N.W.2d 631 (1960); *Lakelands, Inc. v. Chippewa & Flambeau Imp. Co.*, 237 Wis. 326, 295 N.W. 919 (1941); *Brothertown Realty Corporation v. Reedal*, 200 Wis. 465, 227 N.W. 390 (1930); sec. 30.10(4)(b), Stats.)

According to Wis case law, a meander corner is considered inferior to a regular corner and would control only direction.”

Okaaaayyyy.....?

The opinion excerpt is full of case law citations and arguments all leading to the key point which is the final sentence: According to Wis case law, a meander corner is considered *inferior* to a regular corner and would control only direction.

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What effect does this have on MC use in Wis?

Figure 29(a) shows the record information for a Section line crossing a river. MCs were set on both sides of the river. Directions were not given so distances are used as record cardinal equivalents.

A recent field investigation found both Section corners and MCs and deemed the E1/4 cor lost. The directions and distances between successive corners were measured, Figure 29(b).

In Figure 29(c) shows the N/S cardinal equivalents of the measured line segments.

$$A \text{ to } B: 1049.20\text{ft} \times \cos(4^\circ 30' 45'') = 1045.95\text{ft}$$

$$B \text{ to } C: 746.25 \times \cos(5^\circ 18' 25'') = 743.04\text{ft}$$

$$C \text{ to } E: 3515.40\text{ft} \times \cos(3^\circ 10' 50'') = 3509.99\text{ft}$$

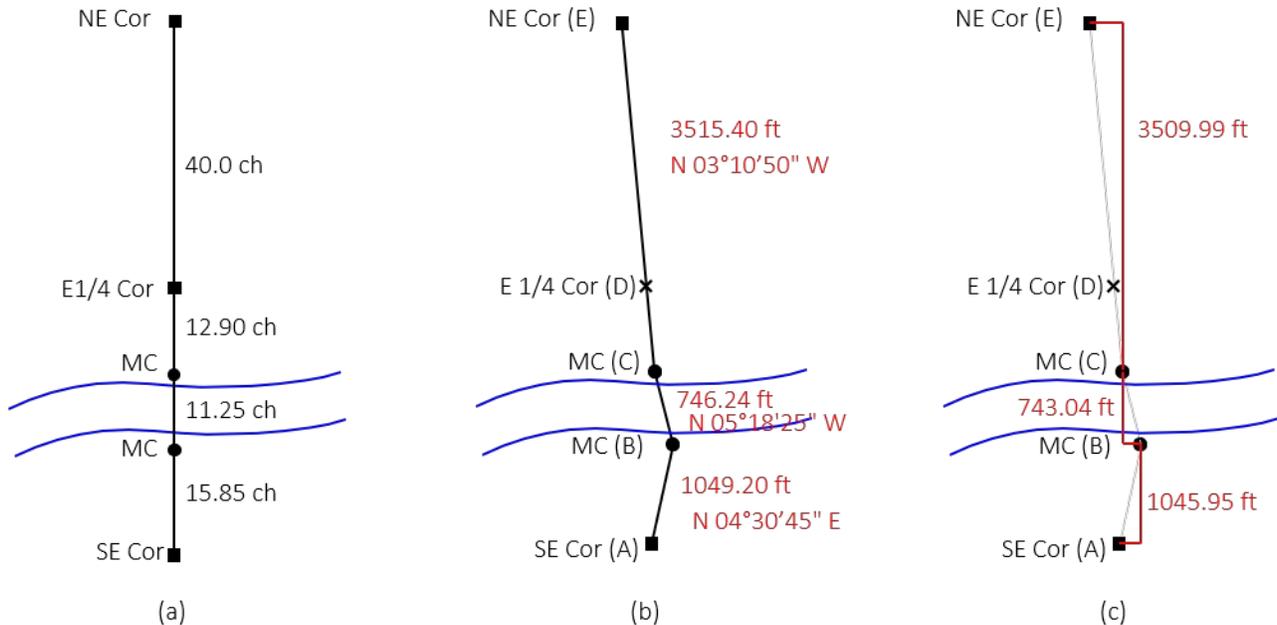
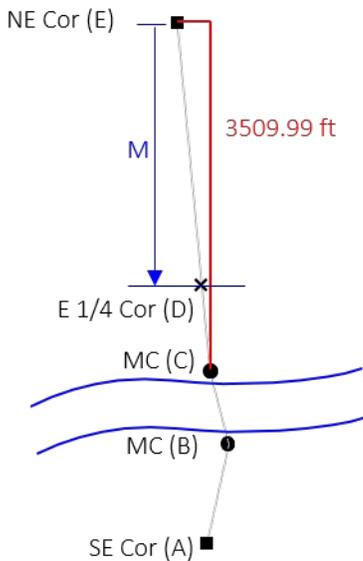


Figure 29: Meander and Lost Corners

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The lost E1/4 cor (D) would be re-established using SPM.

Per *Manual*:



The MC at (C) can be used to control distance and direction.

Re-establish the E1/4 cor proportionally between points E and C:

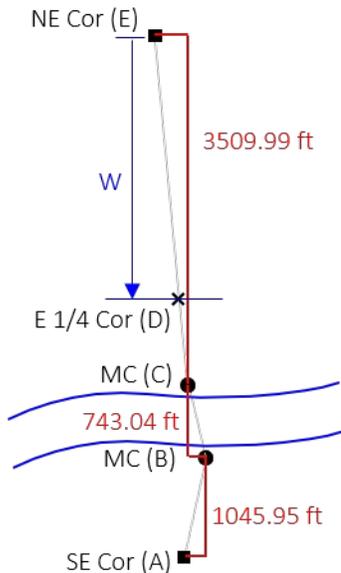
$$\frac{40.0ch}{(40.0ch + 12.90ch)} = \frac{M}{3509.99ft}$$

$$M = 3509.99ft \times \left[\frac{40.0ch}{(40.0ch + 12.90ch)} \right] = 2654.06ft$$

Measure South 2654.06ft from E and project an E/W line to intersect the line between points C and E.

Figure 30: *Manual* Method

Wisconsin method:



MCs may only be used for direction control, not distance. The lost E1/4 cor must be set by SPM between the Sec cors, E and A.

Record distance between Sec corners is

$$40.0ch + 12.90ch + 11.25ch + 15.85ch = 80.00ch$$

Contemporary cardinal equivalent total is:

$$3509.99ft + 743.04ft + 1045.95ft = 5298.98ft$$

Proportionate distance from point E:

$$\frac{40.0ch}{80.00ch} = \frac{W}{5298.98ft}$$

$$W = 5298.98ft \times \left[\frac{40.0ch}{80.0ch} \right] = 2649.49ft$$

Measure South 2649.49ft from E and project an E/W line to intersect the line between points C and E.

Figure 31: Wisconsin Method

There's a difference of 4.57ft N/S between the two methods, 4.58ft along the Section line. That represents a difference of 1/1200 - pretty significant.

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c. Bottom Line?

Which method should you use? Although the Attorney General's Opinion is just that, an opinion, and not statute or common law, the cases cited support the Wisconsin Meander Corner Method. It is also consistent with how meander corners are used in non-PLSS property surveys in Wisconsin. In the past Wisconsin had adopted PLSS Center of Section methodologies which differed from Federal rules so following a contrary path is nothing new. Taking all this into consideration, until case law changes or the principle is directly addressed in statutes, the Wisconsin Method should be used.

This difference in a "simple" SPM circumstance is an excellent example of why proportionate measurement is a last resort method. If there is no other credible evidence, then we have a 4.6ft dilemma.

5. Curved Lines

Base line, Corrections lines, and N & S Township lines were run as true lines of latitude. A point set E/W using SPM on any of these should be offset to the south to correct it to the latitudinal line. The *1973 Manual* explained how to determine the offset using the *Standard Field Tables and Trigonometric Formulas* publication. The *2009 Manual* briefly discusses it and even gives the correction at the middle of a one mile line at 45° latitude, but doesn't explain how to compute it¹.

How large is an offset? It depends on:

- distance between the control corners used for SPM
- distance the re-set corner is along the line between the control corners
- latitude of the line

For example at latitude 45°30', offsets for corners re-established by SPM between two township corners, Figure 32, are.

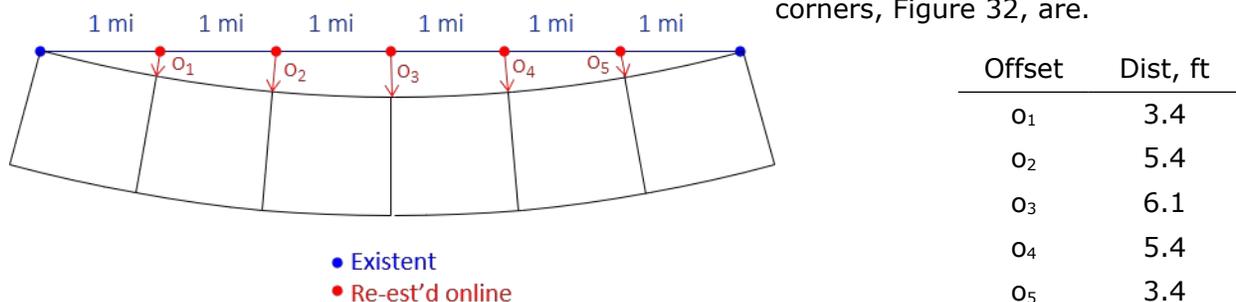


Figure 32: Township Line Offsets

A 5.4ft offset is pretty significant. The offset at a Quarter corner between two found Section corners at the same latitude is 0.2 ft, relatively insignificant.

Should it be applied?

2009 Manual Section 7-17.

In order to restore a lost corner on a line by single proportionate measurement, a

¹*Offset.xls* is an Excel workbook to compute latitude offset. It's available at this Seminar's webpage at jerrymahun.com.

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retracement is made connecting the nearest identified corners on the line. These corners control the position of the lost corner. The lost corner is then reestablished at proportionate distance on the line connecting the recovered corners. Proper adjustment is made on an east and west line to secure the latitudinal curve. Any number of intermediate lost corners may be located on the same plan.

Latitude offset should be applied to corners on Standard Parallels and North and South Township boundaries.

D. Limited Control

Limited control means a lost corner was originally tied to fewer corners than are needed to re-establish it by SPM or DPM. Or, all the corners needed for control on one side are also lost so there is nothing to proportion against.

There are three conditions: Three-Point Control, Two-Point Control, and One-Point Control. The *Manual* classifies Two- and Three-Point as Primary Methods, One-Point as Secondary. In all three cases, at least one controlling point was never established so a proportion cannot be established in that direction. Record information must be used to help re-create the lost corner location.

1. Three-Point Control

Three-Point Control (3PC) is used when a controlling point doesn't exist on one side of a DPM situation, Figure 33(a).

In the direction of bounding control, the measurements are reduced to cardinal equivalents. A temporary point is set at the proportioned distance.

In the direction where only a single control point exists, a second temporary point is set at the cardinal record distance, Figure 33(b).

As with DPM, True E/W and N/S lines are run through the temporary points. The lost corner is re-established at their intersection, Figure 33(c).

The new lines connect the three control points with the newly re-established corner, Figure 33(d).

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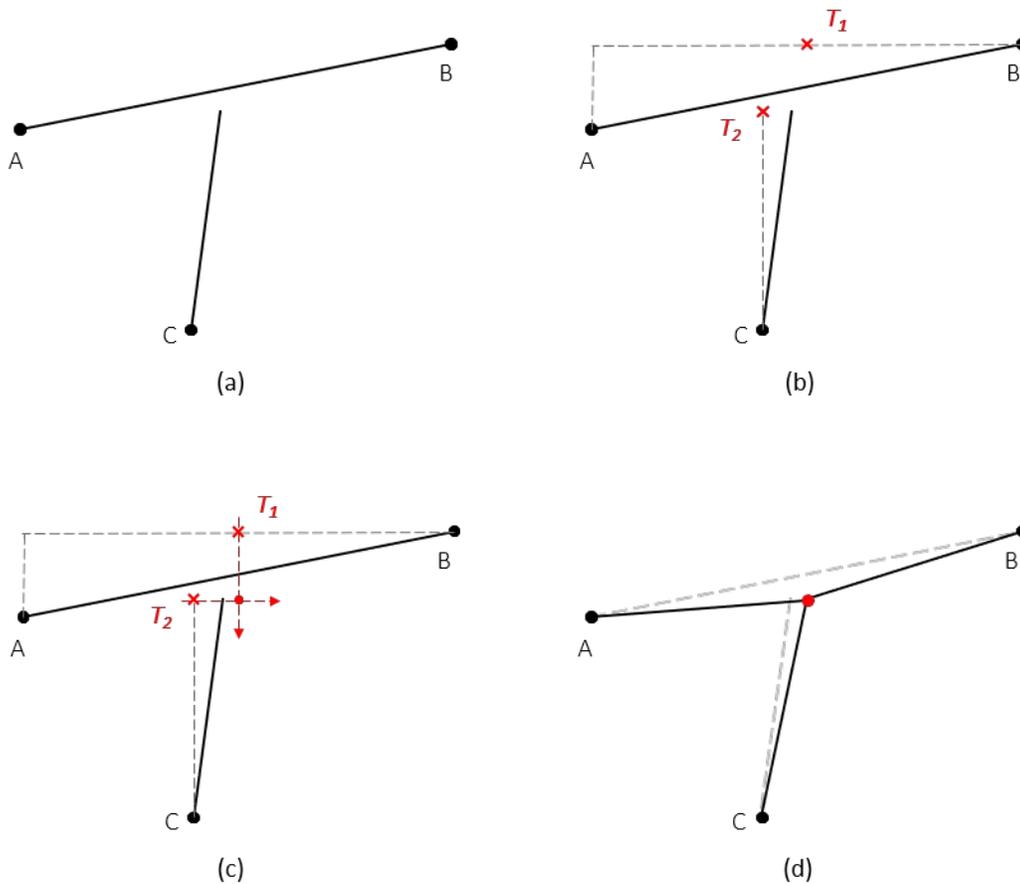


Figure 33: Three-Point Control

2. Two-point Control

Two-Point Control (2PC) is used when there is only a single controlling point in both directions of a DPM situation, Figure 34(a).

Place temporary points at the cardinal equivalents of the record measurements, Figure 34(b).

Extend cardinal lines through each temporary point and re-establish the lost corner at their intersection, Figure 34(c).

The new lines connect the two control points with the newly re-established corner, Figure 34(d).

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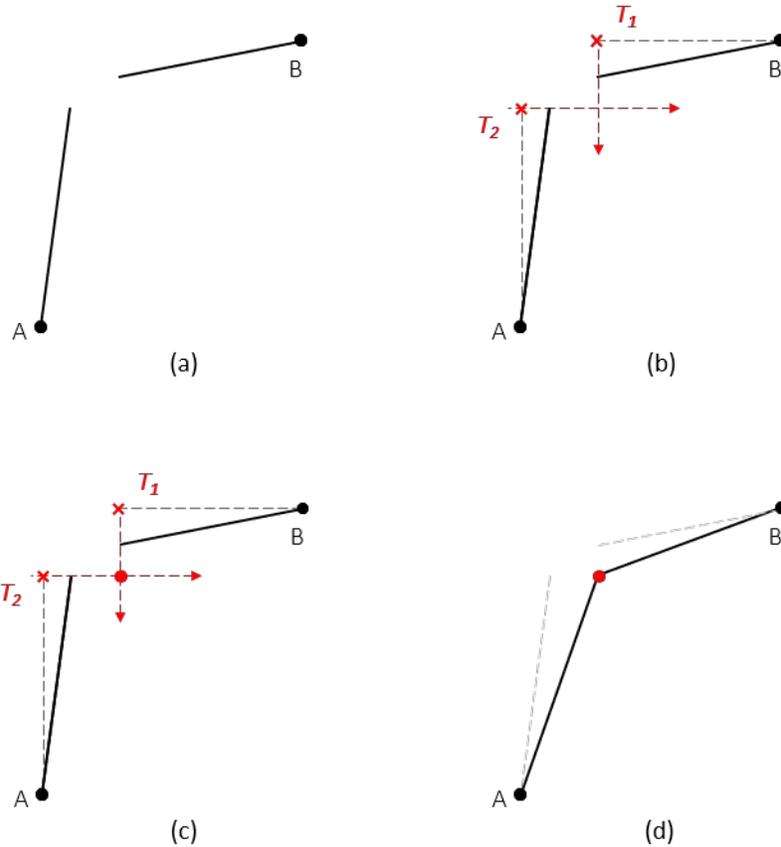


Figure 34: Two-Point Control

3. One-Point Control

The lost corner is connected to a single record corner, Figure 35(a), and is restored at the record distance and direction, Figure 35(b). Cardinal equivalents are not used.



Figure 35: One-Point Control

4. Meanwhile, Back in Wisconsin...

Because MCs are not used to control distance proportioning what normally would be 3PC in other states might be 2PC in Wisconsin; 2PC might be 1PC. What if the only control corner connected to the lost corner is an MC?

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E. Other Methods?

1. Irregular Boundary Adjustment

The 2009 Manual categorizes this as Secondary Method. It is applicable to Townships whose exteriors are not straight due to multiple partial surveys, modifications of prescribed methods, or erroneous procedures.

A retracement is run using record dimensions between accepted positions. The misclosure is determined by measuring the distance between the final measured point and corresponding accepted position.

Figure 36 shows a record traverse run from SW cor Sec 36 to SW cor Sec 31. The inset shows the misclosure reduced to cardinal equivalents. The E/W line position of each lost corner is determined by SPM; The N/S offset is determined using the Compass Rule.

On N/S lines, SPM determines the N/S location and Compass Rule the E/W offset.

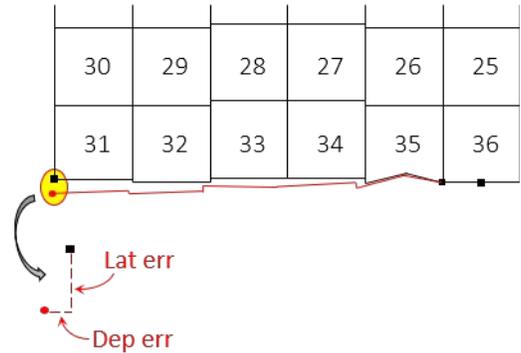


Figure 36: Irregular Township Boundary

2. Combination

The final method defined in the *Manual* is, basically, at the surveyor's discretion. Because of local conditions, now and at original survey time, as well as quality of the original survey (or), other methods may not provide a *reasonable* result. Combining two (or more) methods may yield a location better reflecting original intent. It's a judgment call on a corner-by-corner basis.

III. Perpetuation

Once a position is determined (or verified) it must be perpetuated, in physical and written form. This is just a brief overview to tie up things a bit.

A. Monumentation

Physical perpetuation may require a new monument and/or additional references. These are statutorily identified in:

Wis Stats 60.84 *Monuments* (3)(c)

- Where monuments will be placed (original corners)
- Physical attributes
- Markings
- Placement depth

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Wis Stats 59.74 *Perpetuation of section corners, landmarks* (2)(a) which describes witness monument requirements

B. Documentation

Wis Admin Code A-E 7.08 *U.S. public land survey monument record*

- Under what conditions a written record must be filed.
- Approved format and required content.
- Addendum requirements

Key elements of the record are A-E 7.08(3)

(b) A description of any record evidence, monument evidence, occupational evidence, testimonial evidence or any other material evidence considered by the surveyor, and whether the monument was found or placed.

(c) Reference ties to at least 4 witness monuments. Witness monuments shall be concrete, natural stone, iron, bearing trees or other equally durable material, except wood other than bearing trees.

(d) A plan view drawing depicting the relevant monuments and reference ties which is sufficient in detail to enable accurate relocation of the corner monument if the corner monument is disturbed.

(e) A description of any material discrepancy between the location of the corner as restored or re-established and the location of that corner as previously restored or re-established.

(f) Whether the corner was restored through acceptance of an obliterated evidence location or a found perpetuated location.

(g) Whether the corner was re-established through lost-corner-proportionate methods.

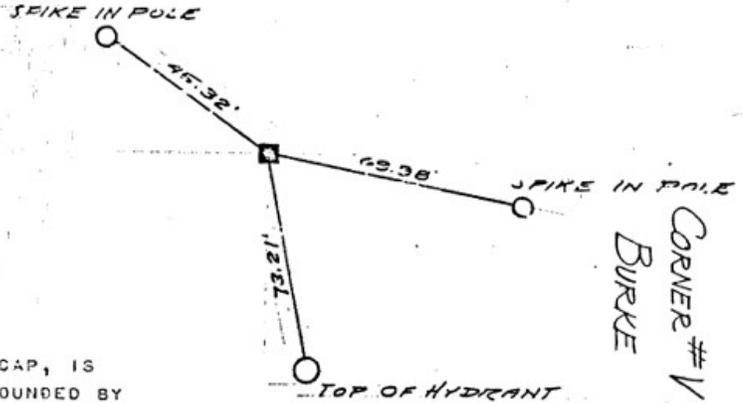
(h) The directions and distances to other public land survey corners which were used as evidence or used for proportioning in determining the corner location.

The record provides the lineage and authority for a perpetuated position. Whether to accept an existing replacement monument at a PLSS corner depends on the evidence used to place it. Without that information on the PLSS Monument Record, the character of the monument is suspect.

Figures 37-41 show corner information from five consecutive Monument Records of the same corner. They start with the first Record filed in 1965 and continue to last filed in 2012 - 47 years of corner history. What can we say about the corner location certainty? What would you do if you wanted use this corner for a commencement point?

PLSS Lost Corner Re-establishment

N



DETAILED DESCRIPTION:

THIS CORNER, A CONCRETE MONUMENT WITH CAP, IS LOCATED IN THE INTERIOR OF THE BLOCK BOUNDED BY FOARD STREET, HOFFMAN STREET, ANDERSON STREET, AND JOHNSON STREET IN TRUAX FIELD. THE MONUMENT IS APPROX. 350 FEET EAST OF JOHNSON STREET.

SURVEYOR'S AFFIDAVIT: (Surveyor must certify the method by which the above described corner has been located or relocated)

STATE OF WISCONSIN
DANE COUNTY

I HEREBY CERTIFY THAT AFTER CONSIDERATION OF THE FIELD NOTES OF THE ORIGINAL
GOVERNMENT SURVEYS, THIS CORNER WAS SET ONLINE BETWEEN THE SOUTH $\frac{1}{4}$ CORNER OF
SECTION 30 AND THE SOUTHEAST CORNER OF SECTION 29 AND AT A PROPORTIONATE
DISTANCE.

Figure 37: S1/4 Sec 29 T08N R10E - 1965

PLSS Lost Corner Re-establishment

The monument found at this location is a standard City of Madison monument with brass cap. It is located in the interior of the block bounded by Anderson Street, Hoffman Street, Pearson Street, and Foard Street in Truax Field. the monument is approximately 350 feet east of Pearson Street.

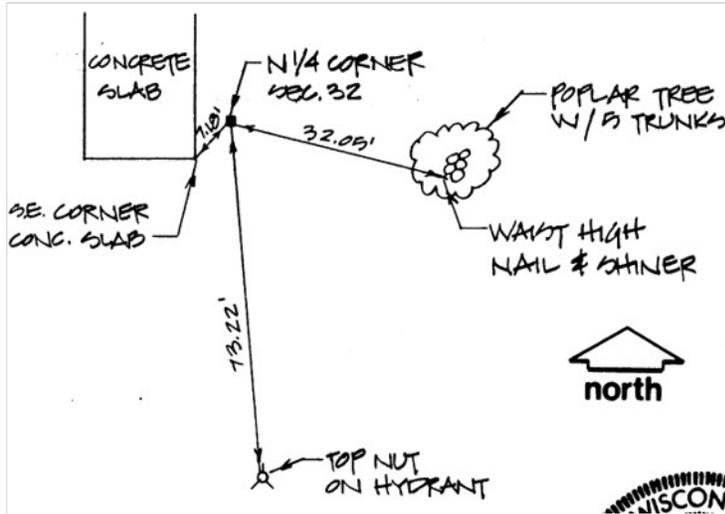


Figure 38: S1/4 Sec 29 T08N R10E - 1983

Found spike in MATC parking lot

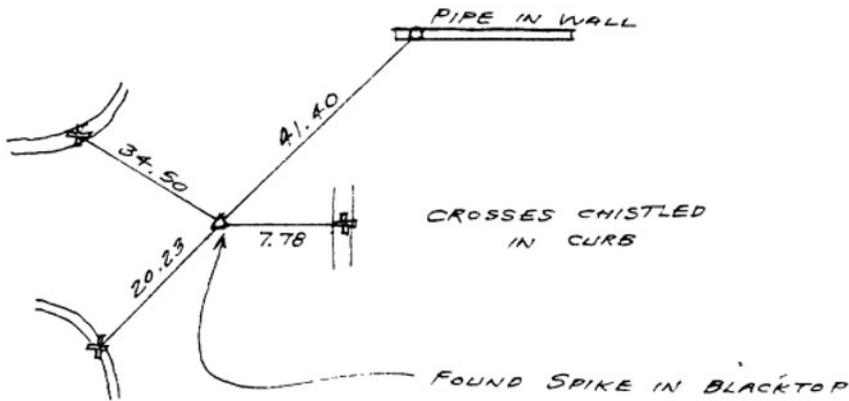


Figure 39: S1/4 Sec 29 T08N R10E - 1999

PLSS Lost Corner Re-establishment

Section 29 Corner of Section 29 Township 08 North-Range 10 East

Record Coordinate Values (for reference only) - SPCS 27, Ft Grid

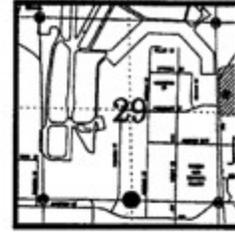
Y	409337.66	X	2177505.68	NGVD 29	854.07
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Monument Type

Brass Cap	Alum Cap	X	In Monument Box	In Water Box
X	Others	Note: 60d spike in blacktop parking lot, set by unknown		

Historical Data

1965	Anthony Thousand (set brass cap monument)
1999	David R. Chaney (found 60d spike set by unknown)
2003	Ayres Associates (found 60d spike replaced with 1 1/4" rebar)



Was the corner reestablished through lost proportionate methods? **No**
 If so, show on the reverse side of this document the method, including the directions and distances to other public land survey corners used as evidence or used for proportioning the corner location

Note: Foot is US Survey Foot

Measured Coordinate Values NAD 83(1991) NAVD 88		Calculated Values using WISCON 1.7b			
SPCS 83(1991), Ft Grid		SPCS 27, Ft Grid		WCCS Dane Zone 1991 Ft	
Latitude	43 07 16.246445	Y	409342.2640	Y	499787.12
Longitude	089 20 06.954326	X	2145969.8180	X	834218.10
Ellipsoid m	225.354	NGVD 29, Ft	852.320		
GH 1999 m	-34.434				
RMS, Feet		Converg Ang	0 27 24.269	Reference Stations	
N= 0.07		Scale Factor	0.9999444	Eagle School, Patriot Park Burr Jones, Dominion, 070, Sun Prairie 2, V107, P107	
E= 0.09					
UP= 0.06					

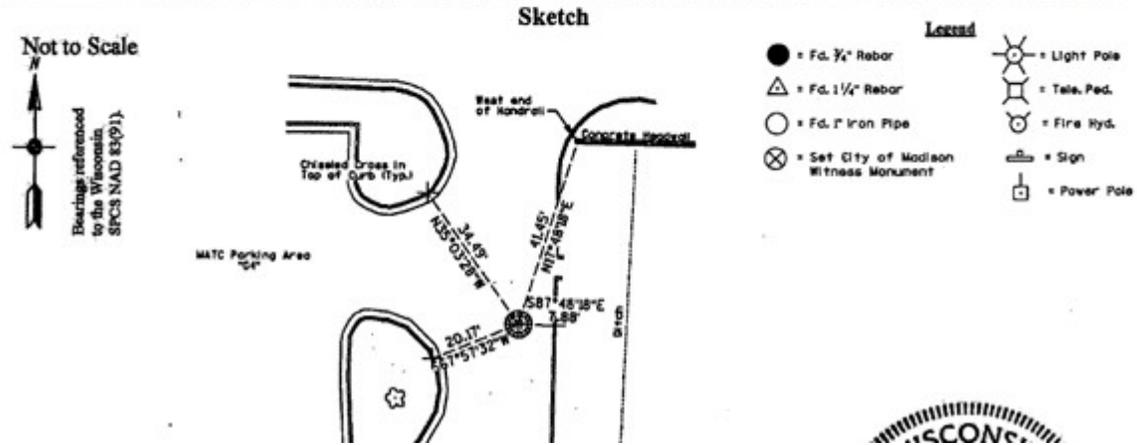


Figure 40: S1/4 Sec 29 T08N R10E - 2004

PLSS Lost Corner Re-establishment

Wisconsin County Coordinate System, Dane Zone Coordinates:

N: 499787.12
E: 834218.10

(b) (f) (g) (h) Description of monument found at this corner and if it was accepted, state all evidence (material, testimonial, occupational, plats, records, other monuments) used as a basis for accepting. If not accepted or if nothing was found, state evidence used as basis for establishing location. If reestablished through lost corner proportionate methods, indicate all monuments, distances and directions used to establish.

THE CORNER WAS REMOVED DURING CONSTRUCTION OF NEW MADISON COLLEGE FACILITIES. SET NEW STANDARD BERNSTEIN MONUMENT WITH BRASS CAP IN CITY OF MADISON MONUMENT CASTING. FOUND THE CUT CROSS EAST OF THE MONUMENT PER DANE COUNTY TIE SHEET FILED BY CARL M. SANDSNES, S-1819, DATED 04/06/2004. 1 SET 4 NEW TIES AS SHOWN HEREON.

DANE COUNTY SECTION CORNER REFERENCE NUMBER **40710332000**.
CITY OF MADISON SECTION CORNER INDEX NUMBER **710150**.

(c) (d) (e) Plan view of corner with ties to at least 4 witness monuments. If in disagreement with previously established corner, show the distances between the two corners and also indicate the ties to the disputed corner.

LEGEND

- ⊕ GOVERNMENT CORNER
- ⊕ WITNESS MONUMENT SET
- ⊗ CHISELED 'X' SET
- ⊗ CHISELED 'X' FOUND
- LIGHT POLE
- SECTION LINE
- EDGE OF CONCRETE
- ▬ CONCRETE CURB & GUTTER
- ▭ BITUMINOUS PAVEMENT
- ▭ CONCRETE PAVEMENT

NOTES

1. BEARINGS FOR THIS SURVEY AND MAP ARE REFERENCED TO THE WISCONSIN COUNTY COORDINATE SYSTEM, DANE COUNTY. THE SOUTH LINE OF THE SOUTHEAST QUARTER BEARS S 88°39'02" E.
2. FIELD WORK PERFORMED BY JSD PROFESSIONAL SERVICES, INC. OCTOBER 31 AND DECEMBER 7 2012.

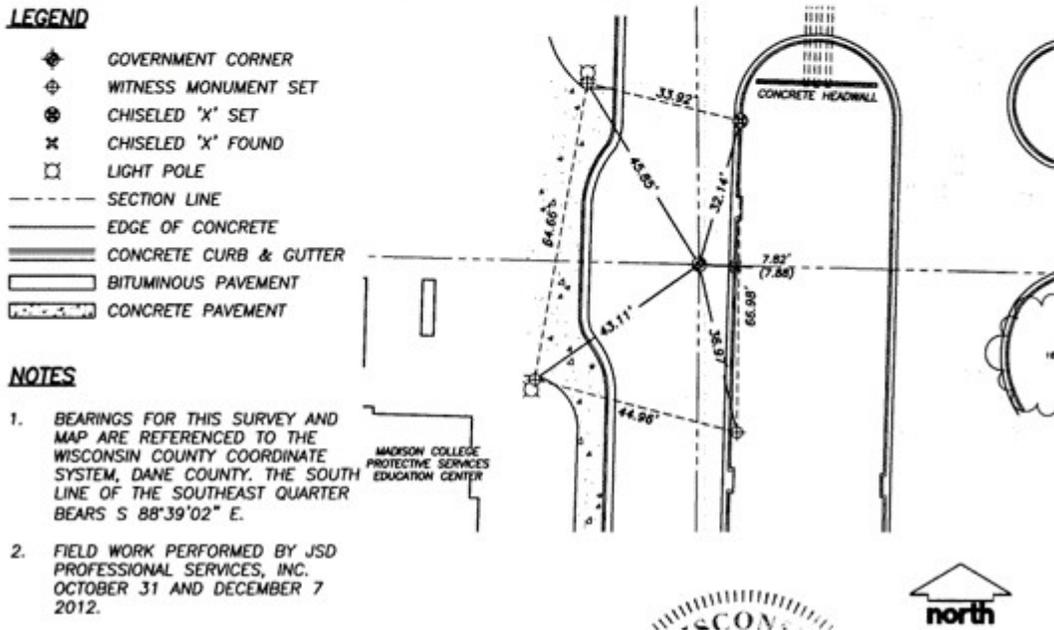


Figure 41: S1/4 Sec 29 T08N R10E - 2012