



Highway Maintenance Manual

Bureau of Highway Maintenance

Chapter 9 Right-of-Way Use & Permits

~~December 2010~~ August 2021

Section 15 Utility Accommodation

Subject 35 Survey Monument Protection

1.0 General

This ~~procedure~~ policy provides guidance on:

- ~~(1) Preventing the survey monument disturbance or destruction of survey monuments due to utility work,~~
- ~~(2) Preventing survey operation interference to survey operations by a utility facility (Figure 1), and~~
- ~~(3) Providing WisDOT with sufficient notice when a survey monument must be relocated and there is no other viable location for placing a utility facility within WisDOT right-of-way (R/W).~~



Figure 1. Pedestal too close to R/W pin.

Effective with utility permits issued on or after ~~the effective date of this policy~~ December 1, 2010, a utility shall relocate any portion of its facility at its own cost when found not to be in compliance with ~~the this~~ policy. Failure to do this may cause the utility's permit associated with the facility to be revoked.

2.0 Definition of Terms

~~Five types of survey monuments~~ The following terms are defined and used in this policy:

1. Boundary line. A line of demarcation between adjoining lands. Boundary lines may delineate areas of different political jurisdiction and/or land parcels. Land parcel boundaries are more commonly referred to as "property lines."
2. Geodetic Survey Control Station: A survey monument with a precise latitude and longitude used for horizontal control, a precise elevation used for vertical control, or both, which has been established by the most rigorous surveying methods to meet the specifications set forth by the National Geodetic Survey (NGS). A typical geodetic survey control station established by WisDOT's Height Modernization Program is a 3.5" bronze disk set in a 16" diameter concrete post (Figure 2) with the survey monument's position of record published as part of NGS' National Spatial Reference System (NSRS).
3. Global Navigation Satellite System (GNSS): A term used to describe a satellite navigation system from any country or region that is also available for civilian surveying applications. In the United States, the GNSS system is the global positioning system (GPS).
4. Monument: A physical object that indicates the location of a point determined by survey. Monuments may include, but are not limited to, a brass disk in concrete, iron rods or pipes with or without plastic caps, chiseled Xs, PK nails, etc. (Figure 3). More than one monument may define a location. The terms monument, mark, landmark, corner, point and station are not synonymous but are often used interchangeably.
5. Property monument: Monument(s) placed on or near a boundary line (typically at a corner) that identifies a boundary point between two properties.
6. Reference monument: A monument used in situations where a USPLSS corner is in a location where a permanent monument cannot be established, would be subject to destruction, or causes safety concerns. Most reference monuments are in road ROW where the corner is located in the road. Contact the county surveyor if a Reference Monument is disturbed.



Figure 2. Geodetic survey control station



Figure 3. Monuments

7. Right-of-way line: The line delineating where WisDOT and non-WisDOT interests

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or ownership is located and established by connecting ROW monuments with tangents or curves.

8. Right-of-Way (RAW) monument: Typically, a yellow plastic cap on top of a metal pipe, rebar or pin in the ground that identifies a physical boundary point on a boundary line where between property owned and property not owned by WisDOT owns property or interest(s) on one side of the line (Figure 24).

9. United States Public Land Survey System (USPLSS) monument: A monument that identifies the location of a section corner, quarter-section corner or other boundary feature as defined by the U.S. Public Land Survey System. When a USPLSS monument is located in a road, there may be Reference Monument(s) located in the nearby ROW. The county surveyor shall manage the replacement of any disturbed USPLSS monument. This monument is sometimes called a "government corner."

10. Wisconsin Height Modernization Program (WI-HMP): The statewide vertical, horizontal and gravitational geodetic control network that supports the Wisconsin Spatial Reference System. WisDOT's Geodetic Surveys Unit (GSU) is responsible for WI-HMP development and maintenance. GSU also serves as chief custodian of the statewide Geodetic Survey Control Network including the core functions of replacing/reestablishing disturbed or destroyed geodetic survey control stations. Typically, three protective guard or witness posts surround a geodetic survey control station for the WI-HMP (Figure 5).



Figure 24. RAW monument with yellow cap and yellow plastic post with sign nearby. Posts may be metal too.



Figure 45. Orange guard or white witness posts surround a typical geodetic survey control monument station installation. Some of these monuments may have only 1 or 2 posts.

- **Property:** Typically, a metal pipe, rebar or pin in the ground that identifies a physical boundary point between two properties.
- **Government Corner:** A metal, concrete or stone monument with or without a metal disk that identifies the location of a section corner, quarter-section corner or other boundary feature as defined by the U.S. Public Land Survey System. A government corner is often near the highway centerline, and a reference corner is usually near the RAW line.
- **Reference Corner:** A monument similar in construction to a government corner usually set within 200 feet of a government corner used to assist finding or relocating a government corner. When a government corner exists, a reference corner is usually expendable if a replacement reference corner is installed nearby in accordance with written instructions from the county surveyor. Ideally, the replacement reference corner should be installed prior to destroying the existing reference corner.
- **Geodetic Control:** A metal disk set in a stable object of substantial size (usually a concrete post or structure, or in bedrock) and intended to be permanent (Figure 3). Typically, three protective guard or witness posts surround a geodetic control monument used in the Wisconsin Height Modernization Program (WI-HMP) (Figure 4).

Other terms used in this procedure:

- **Geodetic control station (GCS):** A geodetic control monument having accurate latitude and longitude.

elevation, or both (a three-dimensional **position**). Since any geodetic control station may have or may be upgraded to have a three-dimensional position, a geodetic control monument in Table 1 is assumed to be a three-dimensional GCS and therefore needs an unobstructed path between the monument and the satellites. A GCS used solely for elevation may be referred to as a "benchmark."

- **Right-of-way (R/W) line:** The physical boundary between property owned and property not owned by WisDOT that is typically established with straight lines between R/W monuments although some segments may be arced. Two or more R/W monuments define a R/W line location.

3.0 Property line: The physical boundary between two properties that is typically established with straight lines between property monuments although some segments may be arced. Two or more property monuments define a property line location.

3.0 How Utilities Affect Survey Monuments

Utility excavation can disturb survey monuments either through collapsing soil or pushing dense/frozen soil. Conditions are worse when excavating five feet or deeper, or in sandy or loose soils. Improper backfilling may cause settlement and lead to monument disturbance. With deep excavations, a large area is needed for the removed soil. A monument must be visible to the excavator to avoid covering it with excavated dirt or disturbing it when backfilling. Equipment that runs over, hits, vibrates, or deposits soil (or other materials) on or near a monument can also disturb it. Any aboveground utility facility near a geodetic [survey control station](#) – including overhead lines, poles and guy wires – may interfere with ~~radio~~ signals from the [GPS-GNSS](#) satellites.

Aboveground utility facilities such as poles, pedestals, cabinets, guy anchors, etc., are typically placed close to the R/W line to keep them out of the clear zone. Some may be placed near the intersection of property and R/W lines or bends in the R/W line. These locations follow typical utility accommodation policy as listed in [HMM 09-15-25, 3.1](#) but they are also where survey monuments are located. These utility facilities need to be installed a sufficient distance away from survey monuments to minimize their interference with survey operations and to prevent the monuments from being disturbed or destroyed.

4.0 Utility Project Planning

When designing a proposed utility facility within the R/W, use the location guidance in [Table 1](#). If obtaining the recommended minimum clearance from a survey monument poses a problem, contact a region utility permit coordinator (UPC) as soon as possible. Together with a WisDOT survey staff person, the UPC and utility shall determine the monument's importance, utility options, and a reasonable solution to the problem.

Positioning a large utility to avoid a monument may not be practical because the utility may be limited by other facilities within the R/W including the road itself or if a deep excavation is required. With deep excavations, gradual sideslopes may be needed to meet OSHA standards. The proposed location of a utility facility may seem far enough away from a monument, but the facility's sideslope excavation may ~~actually adversely~~ affect it. In some situations, the only practical solution is to establish a new monument and then destroy the old one.

When the recommended minimum clearance cannot be maintained, regard the monument "in the way of construction" and contact the monument^A owner(s) prior to disturbing^B or destroying it. A ~~government-~~ [USPLSS monument](#) (section corner) or reference ~~corner~~ monument in the way of construction should be identified to the county surveyor in accordance with Wis. Stat. s. 59.74. Specifically, [Wis. Stat. 59.74\(2\)\(b\)1](#) requires the county surveyor to be notified in writing at least 30 days prior to destroying any corner, monument, etc. However, for projects in **WisDOT R/W**, **this notification shall be at least 60 days in advance.**

~~When the monument is a geodetic control station, a new station shall be established prior to disturbing^B or destroying the existing one.~~

For Wisconsin Height Modernization Program (~~WI-HMP~~) station monuments, contact WisDOT at 866-568-2852 or [email-geodetic@dot.wi.gov](mailto:geodetic@dot.wi.gov) as early in the planning process as possible when planning any utility work within 40 feet, when planning any overhead work within 150 feet, or when planning an overhead high-voltage transmission line within 500 feet of a monument.

⇒ For utility facility projects constructed using the minimum clearances in the table, do not specify that the facility be placed "~~at a monument~~" or "~~on the R/W line~~" in permit or contract language. Instead, use "~~near a monument~~" or "~~near the R/W line~~" since **near** is defined in the table as the **minimum** clearance.

5.0 Providing Adequate Protection for Monuments

A utility shall do the following to avoid disturbing monuments:

- Surround WI-HMP monuments and all witness/guard posts with orange safety fence to make the monument more visible for protection. Use a 5-foot radius if posts are not present. Contact WisDOT's Geodetic Surveys Unit if posts are broken or missing.
- Place ~~if a R/W or property monument or a government or reference corner monument does not have a witness post,~~ a lath painted pink and/or with pink survey flagging ~~should be placed~~ nearby to visually indicate the monument location ~~of the monument to minimize the chance of equipment disturbing the monument if a monument does not have a witness post.~~^C
- ~~Do not place~~ if soil is deposited or debris ~~on a monument, then hand dig within an 18-inch radius surrounding the monument when removing.~~ If a soil pile spills onto a monument, remove the material by hand or a soft brush ~~to minimize the potential risk of disturbing it.~~
- See ~~For a geodetic control monument, see~~ Table 1 for specific instructions regarding geodetic survey control stations.

6.0 Disturbing or Destroying Monuments¹ and Associated Replacement Costs

~~When~~ If a utility disturbs or destroys a survey monument during its own project or during a facility move in advance of² a WisDOT improvement project, a utility shall make the proper contact ~~for~~ to replacinge it according to the following:

Monument Type	Contact	Who Replaces
R/ <u>OW</u> or Property	Regional Utility Permit Coordinator	WisDOT* or Utility*
Government <u>USPLSS</u> or Reference Corner	County Surveyor	County Surveyor**
<u>Any Geodetic Survey Control Station</u>	WisDOT <u>Geodetic Survey Unit: 866-568-2852 or geodetic@dot.wi.gov</u>	WisDOT <u>GSU</u> ***

* ~~WisDOT staff may do the work or direct the utility to hire a Registered Land Surveyor.~~ The utility must hire a Wisconsin Professional Land Surveyor to replace disturbed property monuments per Wis. Stat. 443.01(6s)(c). Refer to FDM 9-5-1 for more information on preserving survey monuments.

** The County Surveyor will coordinate the replacement of the monument(s), ~~do the work or delegate it to a Registered Land surveyor~~

*** WI-HMP Program Manager will coordinate the location, construction and survey of all replacement Geodetic Control Station Monuments.

If a utility disturbs or destroys a monument during a WisDOT improvement project, the utility shall contact the WisDOT project manager who shall coordinate the replacement.

When a utility disturbs or destroys a monument, the utility shall pay for all costs to replace it. When a WisDOT project requires a utility to disturb, destroy or interfere with a monument, WisDOT shall pay for all costs to replace it. The cost to replace a disturbed or destroyed monument will typically be substantially less if a utility does the proper coordination prior to it being disturbed or destroyed. Anyone who destroys a monument of public record may be subjected to a fine or imprisonment under Wis. Stat. 59.74(2)(e). Under Wis. Stat. 236.32, failure to replace a subdivision monument, which can also be a R/OW or property monument, may result in a fine or imprisonment.

7.0 Utility Facility Interference with Monuments

If WisDOT determines that:

- A utility placed its facility within the R/OW after a ~~survey~~ monument was in place,
- The facility interferes with a survey operation, **and**
- The facility must be moved, then

The utility shall move its facility at its own cost.

8.0 Utility Facility and Construction Clearances to Survey Monuments

Table 1 shows the minimum clearances necessary between various utility facilities/excavation/equipment and

¹ Assumes that disturbing or destroying monuments is **not** pre-approved by WisDOT

² "in advance of" means the project has not been let for construction

survey monuments. These values may be reduced or increased depending upon the construction techniques approved in a utility's permit. Deviations from the guidelines and the effect on monuments shall be discussed with the WisDOT ~~R~~Region Survey ~~Unit~~ Coordinator prior to [permit](#) issuance ~~of the permit~~.

Table 1: Utility Facility & Construction Clearances to Survey Monuments				
Construction Type	Monument Type ^D	Minimum Clearance ^E		Comments/Recommendations
		Facility or Excavation	Equipment	
(1) Trench or vault < 5' deep	R/OW or Property	Greater of 1:1 slope or 2'	2' – Trench 3' – Vault	
	Government- USPLSS or Reference corner	Greater of 1:1 slope or 3'	3' – Trench 5' – Vault	
	Geodetic survey control station	5'	5' – Trench 10' – Vault	Place fence to encircle monument and all witness/guard posts before working in the area. Use a 5' radius if posts are not present.
(2) Trench or manhole ≥ 5' deep	R/OW or Property	1:1 slope	5'	
	Government- USPLSS or Reference corner	1:1 slope	Greater of ½:1 slope or 5'	
	Geodetic survey control station	1:1 [1½:1] ^F slope	Greater of ½:1 [1:1] ^E slope or 10'	Place fence at minimum radius of 1:1 [1½:1] ^E slope to encircle monument before working in the area.
(3) Foundation for poles, cabinets, or buildings (may or may not be in the R/OW)	R/OW or Property	1:1 slope	5'	
	Government- USPLSS or Reference corner	1:1 slope	Greater of ½:1 slope or 5'	
	Geodetic survey control station	1:1 [1½:1] ^E slope	Greater of ½:1 [1:1] ^E slope or 10'	Place fence at minimum radius of 1:1 [1½:1] ^E slope or 5', whichever is greater, to encircle monument before working in the area.
(4) Excavation for drainage, landscaping, driveway, etc. (may or may not be in R/OW)	R/OW or Property	Greater of 1:1 slope or 2'	2'	
	Government- USPLSS or Reference corner	Greater of 1:1 slope or 3'	3'	
	Geodetic survey control station	Greater of 1:1 [1½:1] ^E slope or 5'	Greater of 1:1 [1½:1] ^E slope or 10'	Place fence at 10' radius to encircle monument before working in the area.
(5) Aboveground pedestal or cabinet	R/OW or Property	2'	3'	
	Government- USPLSS or Reference corner	3'	5'	
	Geodetic survey control station	5'	10'	Place fence to encircle monument and all witness/guard posts before working in the area. Use a 5' radius if posts are not present.

Table 1: Utility Facility & Construction Clearances to Survey Monuments				
Construction Type	Monument Type ^D	Minimum Clearance ^E		Comments/Recommendations
		Facility or Excavation	Equipment	
(6) Pole or structure for supporting overhead lines or an antenna	R/O/W or Property	1' between nearest edge of pole and R/O/W line 3' from monument	3'	A pole should not be placed at the monument or on a R/O/W or property line.
	Government- USPLSS or Reference corner	3' between nearest edge of pole and section line 1:1 slope	5'	A pole should not be placed at the monument or on the section line, or on the line between a government corner and its corresponding reference corner.
	Geodetic <u>survey control station</u>	1:1 [1½:1] ^E slope	10'	Place fence at minimum radius of 1:1 [1½:1] ^E slope to encircle monument before working in the area. A pole should not obstruct the path between a monument and satellites. Contact WisDOT at 866-568-2852 or geodetic@dot.wi.gov when planning : <ul style="list-style-type: none"> ▪ An overhead line within 150' of a geodetic control monument. ▪ To place a transmitting antenna within 500' of a geodetic control monument.
(7) Guy Anchor	R/O/W or Property	3'	3'	A guy anchor should not be placed at the monument.
	Government- USPLSS or Reference corner	1:1 slope	5'	
	Geodetic <u>survey control station</u>	1:1 [1½:1] ^E slope	10'	Place fence at minimum radius of 1:1 [1½:1] ^E slope to encircle monument and all witness/guard posts before working in the area. A guy anchor should not obstruct the path between a monument and satellites.
(8) Overhead Line	R/O/W or Property	N/A	N/A	N/A
	Government- USPLSS or Reference corner	N/A	N/A	N/A
	Geodetic <u>survey control station</u>	The horizontal distance between a monument and a line should be greater than the height of the line above ground	N/A	Utility lines should not be strung over a station since they may cause interference to GPS signals. Different types of overhead lines cause different levels of interference. Contact WisDOT at 866-568-2852 or geodetic@dot.wi.gov when planning an overhead line within 150' of a geodetic control monument.

Table 1: Utility Facility & Construction Clearances to Survey Monuments				
Construction Type	Monument Type ^D	Minimum Clearance ^E		Comments/Recommendations
		Facility or Excavation	Equipment	
(9) High voltage transmission (HVT) line	ROW or Property	N/A	N/A	N/A
	Government- USPLSS or Reference corner	N/A	N/A	N/A
	Geodetic survey control station	Four times the height of the line above ground level	N/A	HVT lines should not be strung over a station since they will cause interference to GPS signals. Contact WisDOT at 866-568-2852 or geodetic@dot.wi.gov when planning a HVT line within 500' of a geodetic control monument.

NOTES

- A WisDOT's [Geodetic Surveys Unit](#) is the primary point of contact for all geodetic survey control station monuments. The primary point of contact for any USPLSS or Reference Monument in the county surveyor. Contact the Region Survey Coordinator about all other monuments or if there are questions~~owner or partial owner of all Wisconsin-Height Modernization Program (WI-HMP) stations, geodetic control stations, and any RAW, property, government corner, and reference corner monuments set near or along STHs.~~
- B "Disturbing," when referring to a WI-HMP station, means the movement of the geodetic control station monument by 1/16" or greater. If a monument is struck by a piece of equipment, it is generally considered as disturbed until it can be resurveyed and proven otherwise.
- C Primary effort should be focused on **not disturbing the monument itself** although a witness post or lath near a monument should not be destroyed either.
- D Not all geodetic control station monuments are part of the WI-HMP. Contact WisDOT's Geodetic Surveys Unit at 866-568-2852 or geodetic@dot.wi.gov to find out if a monument is a WI-HMP station. As conditions change, stations may be added or deleted from WI-HMP. For each utility project, it is recommended to learn the status of a station even if it was known in a previous year.
- E Minimum horizontal clearance for a 1:1 slope should be based the vertical distance from the top of a monument to the bottom of the actual excavation or trench. Figure 5-6 shows an example for a 10-foot-deep excavation. Minimum facility or excavation clearance shall be measured horizontally between the nearest edge of a monument and the nearest edge of a utility trench, excavation, pole, pedestal, etc. Where the side of the trench or excavation is not vertical, the part of the trench or excavation side nearest the monument shall be used to measure the clearance distance. Minimum equipment clearance shall be measured horizontally between the nearest edge of a monument and the nearest edge of the equipment tracks, wheels, outrigger stabilization foot pads, frame, bucket, etc. used for making the trench, hole, or excavation or for setting a pole, vault, cabinet, building, etc.
- F Use the larger slope values shown in blue brackets, [1½:1], when working in unconsolidated, clean granular, or saturated soils. The first number is the horizontal distance between the nearest edge of a monument and the nearest edge of a utility excavation, trench, pole, etc. The second number is the vertical distance from the top of a monument to the bottom of the actual excavation or trench.

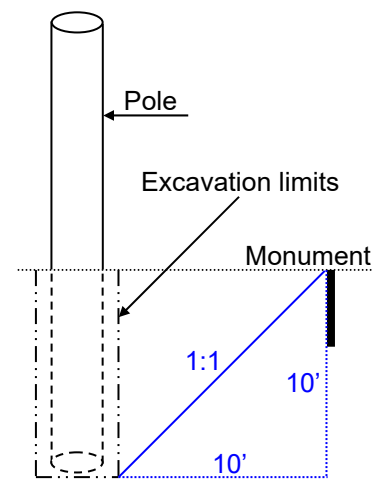


Figure 56. Slope measurement example.