

CHAPTER 5

BOUNDARY MONUMENTS

5-1. Installation of Boundary Monumentation. The installation and the types of monuments used for boundary monumentation should be under the control of the Real Estate Division. Site conditions, the value of the property, the legal description of the property, encroachment possibilities, and local laws and customs are some factors that dictate the economics and practicality of where and what type of monument should be installed. In the absence of specific instructions from the Real Estate Division, the criteria presented in this chapter are offered as guidance.

5-2. Selection of Monument Type Based on Local Site Conditions. The type of monument to be used for boundaries is a function of the site conditions. The different monuments that may be used to mark boundaries are identified in Table 5-1. Construction details are illustrated in Figures 3-1, 3-3, 3-7, and 3-8. All boundary monuments shall be constructed with the standard USACE survey disk.

Table 5-1

Site Conditions and Monument Types for Boundary Control

<u>Site Conditions</u>	<u>Monument Types</u>
Rock outcrops, large boulders, bedrock concrete structures (more than 5 years old)	C
Granular soils (sand and gravel)	F,G
Glaciated soils (till)	F,G
Fine-grained soils (silts and clays with high bearing strengths)	F,G
Fine-grained soils (silts and clays with low bearing strengths)	G
Construction fill (disturbed earth)	G
Permafrost	G
Marsh	A
Subsidence area	A

5-3. Construction and Installation Procedures. The standard USACE survey boundary disk shall be used as boundary monuments constructed as Type C, Type F, or Type G. All USACE survey disks shall be stamped using 3.17-millimeter (1/8-inch) steel dies. All stampings shall deform the disk by a minimum of 1 millimeter (0.0394 inch).

a. Monuments in Concrete or Rock. Refer to Type C monument installation in paragraph 3-2c.

b. Drive-in Aluminum Rod Monuments. The Type F monument is illustrated in Figure 3-7 and constructed as outlined in paragraph 3-2f.

c. Poured-in-Place Concrete. Monuments that are poured in place should be constructed as illustrated in Figure 3-8 for a Type G monument.

5-4. Naming Boundary Monuments. Monuments may be identified by code numbers or alphanumeric symbols as outlined in paragraph 4-3. Monuments may be identified by a name or a designation of a specific corner. All monuments shall be constructed with a USACE survey disk (Figure 3-10) and shall have the right of way (R/W) or boundary stamped thereon.

5-5. Reference Monuments. A reference monument is an accessory and is employed in situations where a regular permanent monument locating the site of a corner cannot be established. Also, reference monuments are required in areas where the corner monument would be liable to destruction and/or bearing trees or nearby bearing objects are not available. When the true point for a corner lies within an unimproved roadway, in such a place as to interfere with travel, an iron rod, pin, or Type F monument shall be buried in the ground at the true corner point. If bearing trees or nearby bearing objects are not available, at least two reference monuments should be established at suitable places outside of the roadway. Allowance should be made for grading, cuts, fills, or other road improvement when placing the reference monuments. If the surface of the roadway is gravel, macadam, or bituminous-topped, approval from the proper authorities should be obtained before placing the point. In the case of a hard surface, a survey disk or "P-K" nail should be placed at the true point. Two reference monuments ordinarily suffice in public survey practice, but four may be employed if desirable. When two monuments are used, they are usually placed equidistant and in opposite directions from the true point. An acceptable alternative is the placement of the monuments so that the lines connecting them with the corner point are approximately perpendicular to each other. If four monuments are used, they should be placed in opposite directions in each of the four quadrants. When the true point is in an engineered road with established right-of-way lines, it is desirable to locate the reference monument on the intersection of those right-of-way lines and the true property

lines that establish the corner point. Appropriate identification, as outlined in paragraph 4-4, shall be utilized.

5-6. Witness Trees and Corners. Each property corner, reference monument and witness corner shall be witnessed by at least three healthy witness (sometimes called "tie" or "reference") trees a minimum of 15 centimeters (6 inches) in diameter and at least 1.2 meters (4 feet) tall. When possible, all witness trees shall be blazed, facing the corner set they reference. Witness trees must also be marked with an x facing the corner at an elevation height of 120 to 150 centimeters (4 to 5 feet) above the ground. Care should be taken to cut the cross to a sufficient depth to leave a set of permanent narrow marks forming a cross with lines about 25 centimeters (10 inches) long. Witness trees to witness corners should be scribed with the symbols W.C. (witness corner). Tree blazing and marking should not be done without the specific permission of the landowner.

a. Witness/Reference/Tie Distance Measurement. All distance measurements shall be horizontal and taken to the center of the tree.

b. Witness/Reference/Tie Directions. The bearing of each distance measurement shall be observed and recorded. A compass is sufficiently precise for this measurement.

c. Witness Corner Monuments. Where physically impossible to set a monument, a witness corner(s) should be set on each converging boundary line, no closer than 150 centimeters (5 feet) from the corner point. All witness corners, identified as W.C., shall be marked with a USACE disk. The distance to the true corner shall be stamped on the disk, along with an arrow indicating the direction.

d. Natural or Physical Monuments. Natural monuments are permanent objects that are works of nature, such as streams, rivers, ponds, lakes, bays, trees, ledges, rock outcrops, and other definitive terrestrial features. A tree standing at a corner may be marked only when permissible. Care should be taken to cause only superficial damage to the tree. Blazing should penetrate the bark and leave an open cut no wider than 8 centimeters (3 inches) and no longer than 25 centimeters (10 inches). Corner trees should be marked with four-way blazes (blazed on all four sides). Trees on a boundary line (line trees) should be face blazed with one hack above and one hack below, on opposite sides of the tree, along a line 120 to 150 centimeters (4 to 5 feet) above the ground. Permission should be obtained before marking any trees. Selected trees within 90 centimeters (3 feet) of the line should be marked with three hacks facing the line and face blazed on opposite sides of the marks 120 to 150 centimeters (4 to 5 feet) above the ground.

5-7. Boundary Marker Sign. In order to aid in the preservation and to serve as a means of easy recovery of newly established

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monuments, a 4- by 4-inch wooden post or equivalent marker shall be set adjacent to the station monument or near one of the reference marks of each station (preferably at the station mark). This post should be a minimum of 170 centimeters (5.5 feet) in length and should be set to project a minimum of 90 centimeters (3 feet) above the ground surface. The post should be painted white with a marker having a legend of black letters attached as indicated by the boundary line or easement line markers shown in Figure 3-11.