
13 Benchmark Posts and Tablets, Monuments, and Right-of-Way Markers

Materials

Benchmark Posts and Tablets

Monuments

Right-of-Way Markers

Construction Requirements

Setting Right-of-Way Markers

Resetting Right-of-Way Markers

Setting Monuments

Re-established Monuments

Setting Benchmark Posts and Tablets

Reset Benchmark Posts

Method of Measurement and Payment

Standard Drawings

CHAPTER THIRTEEN: *BENCHMARK POSTS AND TABLETS, MONUMENTS, AND RIGHT-OF-WAY MARKERS*

This chapter discusses furnishing and setting, setting only, or resetting of right-of-way markers, monuments for marking section or other lines, and bench-mark posts and tablets in accordance with Section **615**.

MATERIALS

BENCHMARK POSTS AND TABLETS

Bench mark posts (Figure 13-1) are required to be of the dimensions indicated on the plans and cast in accordance with applicable provisions of Section **615.03**, except the strength is determined by concrete cores taken from the finished product. At least two concrete cores are taken from each unit and the average strength of the unit is required to be at least 4000 lb/in² with no individual core strength less than 3600 lb/in². Tablets are furnished by INDOT and are set in the posts as indicated on the plans.



Figure 13-1. Benchmark

MONUMENTS

Monuments (Figure 13-2) are required to be of the type specified in the contract. Any portion extending above the ground is finished in accordance with Section **702.20**.

Where concrete is required, Class A concrete is used in accordance with Section **702**. When placed in the forms, the concrete is tamped in layers until mortar covers the outer surface. The tops of the monuments are floated smooth. Monuments are cast in place or precast and then set.

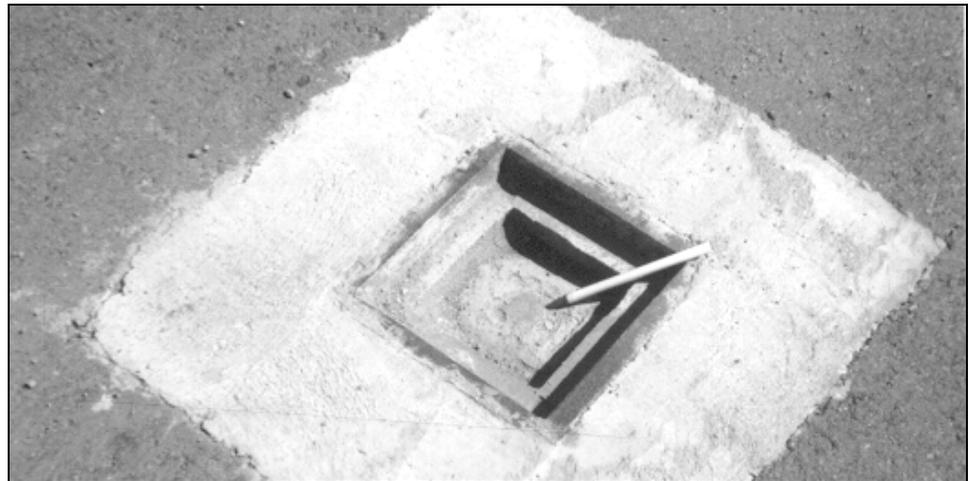


Figure 13-2. Type B Monument

The pin in the monument is set perpendicular to and flush with the top of the monument while the concrete is plastic and left undisturbed until the concrete has set. The pin is copper and is required to be 1 in. in diameter and 5 in. long. For type D monuments, the hole is drilled in the center with a 1/8 in. drill for a depth of 1.5 in. The hole is filled with lead flush with the end of the pin. Castings for protected monuments are required to be in accordance with Section **910.05(a)**.

RIGHT-OF-WAY MARKERS

Reinforced concrete right-of-way markers are required to conform to the dimensions and lettering indicated on the plans. The reinforcement is securely held in place by at least four spacers of an approved design.

The markers are required to have a smooth workmanlike finish free from cracks, patches, honeycomb, exposed reinforcement, and excessive bubble holes. Each marker is plainly marked near the bottom with the trademark or initials of the manufacturer and the date of manufacture. These letters and figures are no less than 1 in. in height and indented 1/8 in. Right-of-way markers require a Type C certification in accordance with Section **916**.

CONSTRUCTION REQUIREMENTS

SETTING RIGHT-OF-WAY MARKERS

The back face of right-of-way markers (Figure 13-3) is required to be set on right-of-way lines approximately 1000 ft apart. Markers are set at all corners of irregular right-of-way lines, opposite each P.C. and P.T. of curves, and not to exceed 500 ft apart on the inside and outside of curves. Markers on tangents are located so that the marker is plainly visible from each of the adjacent markers.



Figure 13-3. Right-of-Way Marker

Markers are set plumb to the depth required on the plans and with the letters facing the pavement. Portions of the holes not occupied by markers are backfilled and compacted in layers with suitable material to the level of the original ground. The markers may not be displaced during backfilling.

Markers are typically set with 18 in. of exposed face except for lawns in urban areas where the marker is set flush with the existing ground (Figure 13-4).



Figure 13-4. Right-of-Way Marker set Flush with Ground

RESETTING RIGHT-OF-WAY MARKERS

When the contract provides that existing right-of-way markers be reset, the existing markers are required to be removed and reset at designated locations in accordance with Section **615.07**.

SETTING MONUMENTS

INDOT sets monuments to define section lines and to permanently establish vital survey points. Monuments are described and indicated on Miscellaneous Standard Sheet **MA**. These monuments are Section Corner Monuments and Monuments as listed below for survey lines (Figure 13-5).

- 1) Monument Type "A" for vitrified brick or HMA surface on concrete base
- 2) Monument Type "B" for HMA pavement
- 3) Monument Type "C" for outside the pavement area
- 4) Monument Type "D" for concrete pavement



Figure 13-5. Survey Monument Sign

All section corners and quarter section corners that fall within the right-of-way for a new or re-constructed facility are required to be established. The local county surveyor establishes all section corners and section lines not already defined by monuments at the time of construction. Should the county surveyor fail to establish such points as requested, the monument is eliminated from the contract.

Original survey points (e.g. P.I.'s, P.C.'s, P.T.'s, P.O.T.'s and P.O.C.'s) are monumented so that the original survey line for the highway facility may be re-established accurately after construction. Intermediate points are monumented so that a surveyor may see a range pole set on an adjacent monument in at least one direction. Also, monuments are located so that the line of sight between adjacent monuments falls within the right-of-way.

If the location of a monument falls within the limits of a concrete pavement, a copper pin, the details of which are indicated on the plans, is required to be set perpendicular to and flush with the top of the finished pavement. The pin is placed just before the concrete takes initial set and then left undisturbed until the concrete has set. Other monuments are required to be of the type shown on the plans, depending on the type of surface of the pavement in which they are placed or if they are placed outside the pavement. Necessary excavation is done to the required depth. The bottom of the excavation is required to be firm and true to line and grades given. After a monument is in place, the remaining excavated areas are backfilled with suitable material firmly tamped in layers. The monument may not be disturbed during this operation.

Existing monuments, which are not required to be disturbed or re-established but which are disturbed during construction operations, are required to be re-established.

RE-ESTABLISHED MONUMENTS

Existing monuments may need to be re-established in pavements or bases which are disturbed unavoidably or covered by operations done in the contract.

If the existing monument contains a brass or copper pin, the pin is extended to the surface of the new pavement by attaching a brass or copper pin of at least a 1 in. diameter and of the length required. These extensions are attached by tapping the original pin and providing a necessary screw attachment such that the extension may be fastened securely to the original pin. The tapped hole is at least 0.25 in. in diameter and no less than 1 in. deep. The screw attachment is required to have the same diameter as that for the hole in the original pin and be no less than 1 in. in length. Where an existing monument has not been re-established on a previous contract, the monument is re-established in the same manner.

Where existing monuments are protected and encased in cast iron, the castings are adjusted to meet the elevation of the proposed surface by means of an asphalt coated, cast iron, adjustment casting. The size is the same as the original casting, and the depth necessary to meet the elevation of the proposed new surface is used.

SETTING BENCHMARK POSTS AND TABLETS

Benchmark posts are required to be set at locations indicated on the plans or as directed. Excavation is made to the depth indicated and to dimensions sufficient to provide for the concrete backfilling. This concrete is Class A and extends for 6 in. around and below the post. The bottom is required to be monolithic with the sides. The remainder of the excavation up to the original ground line is backfilled with suitable material that is well tamped in layers. Care is taken not to disturb the post. When specified on the plans, or directed, benchmark tablets furnished by INDOT are placed in newly constructed or existing drainage structures located within the limits of the contracts.

RESET BENCHMARK POSTS

When the contract provides that existing benchmark posts be reset, the existing benchmark posts are removed and reset at designated locations in accordance with Section **615.11**.

When the relocation of an existing bench mark post is necessary, an item in the contract is included as "Reset Bench Mark Post". Resetting is the same as for a new bench mark post.

Other permanent benchmark systems are required to be saved. These include benchmarks for:

- 1) U.S. Coastal and Geodetic Survey
- 2) U.S. Geological Survey
- 3) U.S. Army Engineers
- 4) Indiana Flood Control & Water Resources System

The appropriate agency is notified by INDOT Design when a benchmark is found during the original survey that construction for the contract may disturb. A new benchmark tablet along with relocation instructions is available in advance of construction.

If an existing benchmark is discovered and may be disturbed during construction, a letter is required to be sent to the agency involved. The necessity for the move and the designation of the tablet is included in the request. The agency involved is required to send a new tablet properly stamped to show the benchmark has been reset and the necessary instructions for setting.

METHOD OF MEASUREMENT AND PAYMENT

Right-of-way markers, reset right-of-way markers, monuments, re-established monuments, castings adjusted to grade monuments, bench mark posts, and reset bench mark posts are measured by the number of units installed and paid for at the contract unit price per each complete in place.

STANDARD DRAWINGS

The following Standard Drawings include further details of benchmark posts and tablets, monuments, and right-of-way markers.

615-RWPB-01
615-SCMN-01
615-SLBM-01
615-SLMN-01