823.01 Description. This work consists of furnishing, placing, and maintaining construction layout stakes necessary to perform the Work under the Contract. This work also includes verification, placement, protection, and necessary restoration of project control monuments, monument assemblies, reference monuments (which include centerline monuments and centerline reference monuments), and Right-of-Way monuments.

Ensure that all work associated with setting reference monuments, Right-of-Way monuments, and steel rods in monument assemblies is performed by a Registered Surveyor. Ensure that all other surveying and layout work described below is supervised by a Registered Engineer or a Registered Surveyor.

823.02 Materials. Furnish materials conforming to:

- Concrete, Class C........................................................................................................499
- Cast frames and covers ..................... 711.12, 711.13, or 711.14
- Concrete sand (fine aggregate)..........................................................703.02.A
- Stainless steel bolts..........................................................730.10
- Steel rods ..................................................................................709.01
- Pipe .......................................................... 706.07, 706.09, or 707.45

823.03 References. In C&MS 107.10, replace the reference to Item 604 with Item 823. In C&MS 624.04, replace the reference to Item 623 with Item 823. On Standard Construction Drawing RM-1.1, replace references to Item 604 with Item 823.
823.04 Definitions

A. Survey Monuments. Includes project control monuments, monument assemblies, centerline monuments, centerline reference monuments, and Right-of-Way monuments.

B. Project Control Monument. A surveyed position that is established according to the Department’s Mapping and Survey Specifications and is constructed according to SCD RM-1.1.

C. Monument Assembly. A surveyed position typically set inside pavement that consists of a steel rod housed inside a monument assembly box with a cast frame and cover according to SCD RM-1.1.

D. Reference Monuments

1. Centerline Monument. A surveyed position outside of pavement that consists of a steel rod and aluminum cap encased in concrete according to SCD RM-1.1 that defines the centerline.

2. Centerline Reference Monument. A surveyed position outside of pavement that consists of a steel rod and aluminum cap encased in concrete according to SCD RM-1.1, that defines the centerline based on a specific offset from that centerline.

E. Right-of-Way Monument. A property boundary monument set according to SCD RM-1.1 to comply with Ohio Administrative Code Section 4733-37, “Minimum Standards for Boundary Surveys in the State of Ohio” and ORC 5519.05 and are recited in the Right-of-Way deeds to convey the property or easement rights. Right-of-Way monuments are set at property corners, property line intersections, points along the Right-of-Way and angle points on the Right-of-Way.

823.05 Verification. Verify the position of all survey monuments shown in the Contract Documents prior to construction activities. Use standard acceptable surveying measurement techniques suitable to meet the requirements of Ohio Administrative Code Section 4733-37, “Minimum Standards for Boundary Surveys”. Prepare and submit to the Engineer a report with the coordinates, station, offset, and a description of each survey monument found before beginning earth moving, resurfacing, or paving activities. Include the size, material, condition, any cap stamping or markings, and note any differences from the plan locations of the survey monuments. If additional survey monuments not shown in the Contract Documents are encountered, protect, reference, and preserve them in the same manner as survey monuments that are shown in the Contract Documents. Include the additional survey monuments in the verification report.

823.06 Placement, Protection and Restoration of Survey Monuments. When specified in the Contract Documents, construct survey monuments according to SCD RM-1.1.

Do not disturb survey monuments, cornerstones, or boundary monuments during construction unless specified in the Contract Documents. Restore all survey monuments damaged or destroyed by construction activities.

If the Department must repair, replace, or resurvey the location of any survey monuments, cornerstones, or boundary monuments that are damaged, destroyed, or made inaccessible by the
Contractor or its employees, subcontractors, or their agents, then the Engineer will deduct the costs incurred by the Department from the estimates to the Contractor.

823.07 Project Control. Project control governs all positioning for Department projects. Establish project control monuments according to the Department’s Mapping and Survey Specifications. Construct project control monuments according to SCD RM-1.1.

823.08 Right-of-Way Staking. Stake Right-of-Way lines where work will be performed before beginning the work. Stake Right-of-Way lines by placing tall stakes, properly identified and readily discernible, at points of change in width or direction of the Right-of-Way line and at points along the line so that at least two stakes can be seen distinctly from any point on the line. The Engineer will not require the Contractor to set additional stakes to locate a utility line that is not included as a pay item in the contract, or to determine the property line between properties.

823.09 Construction Layout Staking. Furnish construction layout staking as required to construct the project and along both sides of the centerline of construction, 3 feet (1 m) outside of the grading limits at maximum spacing intervals shown in the table below. Replace staking as directed by the Engineer.

**TABLE 823.09-1 MAXIMUM SPACING OF CONSTRUCTION LAYOUT STAKES**

<table>
<thead>
<tr>
<th>Length of project</th>
<th>Spacing</th>
<th>Length of project</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1/2 mile</td>
<td>200 feet</td>
<td>Less than 1 km</td>
<td>50 m</td>
</tr>
<tr>
<td>1/2 mile to 1 mile</td>
<td>500 feet</td>
<td>1 km to 2 km</td>
<td>200 m</td>
</tr>
<tr>
<td>Over 1 mile</td>
<td>1000 feet</td>
<td>Over 2 km</td>
<td>500 m</td>
</tr>
</tbody>
</table>

Before performing a portion of the Work, submit a copy of the construction layout notes for that portion to the Engineer. The construction layout notes must contain information sufficient for the Engineer to verify the construction layout.

The Contractor is responsible for having the finished Work conform to the lines, grades, elevations and dimensions shown on the plans. Any inspection or checking of the Contractor’s layout by the Engineer and the acceptance of all or any part of it does not relieve the Contractor of that responsibility.

The removal of construction layout stakes at the completion of the Work is a final cleanup item that is required as a condition of full payment for Item 624 Mobilization.

823.10 Providing Electronic Instrumentation. If specified as a pay item, provide the Engineer with electronic instrumentation so that the Department can verify the construction layout, perform check sections, and document pay items. Provide a survey-grade, global positioning satellite (GPS) receiver and data collector. Provide equipment that meets the requirements of the Department’s Mapping and Survey Specifications.

Provide equipment, software, and all three dimensional models needed to verify layout, perform check sections, and document pay items. Train the Engineer on how to use the provided equipment and software and provide technical assistance during the duration of the Work.
Upon completion of the Work, the electronic equipment, computer and software will remain the property of the Contractor.

**823.11 Method of Measurement.** Estimated quantities for replacement of Project Control Monuments, Monument Assemblies, Reference Monuments, and Right-of-Way Monuments expected to be destroyed that are within the project construction work limits are included in the Contract Documents. Estimated quantities for new monuments are also included in the Contract Documents.

Project control monuments, monument assemblies, reference monuments, Right-of-Way monuments, and boundary monuments on or outside the project construction work limits are the Contractor’s responsibility to protect and restore as required. The Department will not pay for restoration of these items.

**823.12 Basis of Payment.** Payment for Construction Layout Stakes includes payment for Right-of-Way staking. The Department will pay for accepted quantities at the contract prices as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>823</td>
<td>Lump Sum</td>
<td>Construction Layout Stakes</td>
</tr>
<tr>
<td>823</td>
<td>Lump Sum</td>
<td>Providing Electronic Instrumentation</td>
</tr>
<tr>
<td>823</td>
<td>Each</td>
<td>Project Control Monument</td>
</tr>
<tr>
<td>823</td>
<td>Each</td>
<td>Monument Assembly</td>
</tr>
<tr>
<td>823</td>
<td>Each</td>
<td>Reference Monument</td>
</tr>
<tr>
<td>823</td>
<td>Each</td>
<td>Right-of-Way Monument</td>
</tr>
</tbody>
</table>
**Designer Note:** Use this supplemental specification on all construction projects that are scoped after October 15, 2010 and that require layout stakes, Project Control Monuments, Monument Assemblies, Reference Monuments, or Right-of-Way Monuments. This specification replaces CMS Item 623 and Items 604 Monument Assemblies, Reference Monuments, and Right-of-Way Monuments.

The Right-of-Way designer will include quantities for proposed monument assemblies and reference monuments in the Right-of-Way plans. Also, the Right-of-Way designer will include quantities to replace any survey monuments that are located within a temporary easement and that they expect the Contractor to destroy during the Work. Carry the quantities for all proposed and replacement survey monuments to the General Summary in the plans.

This supplemental specification also adds the language from Proposal Note 623 for providing electronic equipment for construction layout. At the District’s request, include a pay item for Providing Electronic Instrumentation. The specification requires the Contractor to provide one GPS receiver. This is normally adequate. However, if additional receivers are required, include a plan note to require the additional receivers.