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## Supplemental Technical Specification for

# Vibrating Wire Data Collection Center

SCDOT Designation: SC-M-203-11 (07/19)

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Approved: Division Administrator
By: Federal Highway Administration South Carolina Division

## 1.0 DESCRIPTION

**1.1** Furnish all supervision, materials, equipment, and labor, and related services necessary for providing and maintaining a Vibrating Wire Data Collection Center (VW-DCC) at the locations indicated in the plans and in accordance with this STS. This work consists of installing a data collection center to automatically collect data from the instrumentation indicated in the Department's Geotechnical Instrumentation Monitoring Plan (GIMP). The GIMP is described in the SCDOT Geotechnical Design Manual (GDM). The automated data collection uses a real-time system that is accessible via the internet for the entire duration of the project as determined necessary for evaluating settlement, pressure instrumentation and slope stability, etc., as the embankments are being constructed.

**1.2** The Resident Construction Engineer (RCE) will make available a copy (electronic or physical) of the Geotechnical Subsurface Data Report (GSDR) so the Contractor may become familiar with the project's geotechnical conditions. In addition, the RCE will also provide a copy (electronic or physical) of the GIMP, if a copy was not included in the Special Provisions.

**1.3** **References:** The evaluation of this work, will be based on, but not limited to, the following references:

- 1.3.1 Dunnycliff, J., (1998), Geotechnical Instrumentation Reference Manual, (FHWA-HI-98-034), U.S. Department of Transportation, National Highway Institute, Federal Highway Administration, Washington, D.C.
- 1.3.2 South Carolina Department of Transportation, (latest year) Geotechnical Design Manual (GDM), Latest Version. A copy of the GDM is available on the SCDOT website.

## 2.0 MATERIALS

**2.1** **Vibrating Wire Data Collection Center:** The VW-DCC is an automated centralized vibrating wire data collection center and will be used to collect data from various geotechnical field instruments as indicated in the GIMP. The Contractor's Geotechnical Engineering Consultant (GEC) is responsible for ensuring the compatibility between the VW-DCC and the various geotechnical instruments. The VW-DCC shall be capable of monitoring 16 geotechnical field instruments. The VW-DCC shall have the capability of obtaining temperature readings through the use of thermistors. In addition, each VW-DCC shall also monitor an automated on-site rain

gauge. The automated collection of VW data shall be accomplished by using a data logging system that is sufficiently capable to monitor the VW sensors indicated in the plans. Reserve instrumentation monitoring capacity can be either achieved by using a data logging system with sufficient ports or by having the capability to expand the system if needed. Maintain compatibility between the data logging system and the instrumentation being monitored. In order to maintain compatibility of the systems and be able to get technical assistance from the manufacturer during installation and throughout the project, the VW-DCC system should be supplied/manufactured by the same company that is supplying the other geotechnical instrumentation that are indicated on the plans. In addition, the VW-DCC shall have the following features:

- 2.1.1 Data logging system with sufficient capacity to read and save instrumentation readings. Maintain the data until RCE indicates deletion or overwriting the data is permissible or for 6 months after the completion of the project.
- 2.1.2 The data logging system shall have the reserve capacity to add additional instrumentation if needed.
- 2.1.3 Powered by on-site AC current, with back-up battery power and surge suppression.
- 2.1.4 Telephone/cellular access for transmitting data through the internet.
- 2.1.5 Dedicated server for storing and running viewing software.
- 2.1.6 On-line instrumentation software for reviewing/downloading instrumentation data.
- 2.1.7 Enclosure that protects the equipment from damage during construction, vandalism, and weather.

**2.2** Provide data collected via the VW-DCC to the Department in the format outlined in the GIMP.

### **3.0 SUBMITTALS**

**3.1** Within 30 calendar days before installing the VW-DCC, submit to the Department for review an installation plan, include in the submittal, as a minimum, the following information:

- 3.1.1 Submit the proposed VW-DCC system manufacturer name and cut/product sheet prior to purchase for review and acceptance of the Engineer.
- 3.1.2 Submit locations where the VW-DCC, will be installed for approval, if different from the locations shown on the plans. Include with the location and the designation assigned to each VW-DCC, if different from the designation indicated on the plans.
- 3.1.3 Proposed installation method for the VW-DCC.
- 3.1.4 Proposed method to protect the VW-DCC and individual instrument cables during construction from construction equipment and vandalism.
- 3.1.5 *Qualifications*

- a. Identify the surveyor licensed pursuant to the laws of South Carolina who shall be responsible for providing the location of the VW-DCC during installation.
- b. Identify the Geotechnical Engineering Consultant (GEC) that will be responsible for installing the VW-DCC in accordance with the Department's GIMP. Select the GEC from those firms who are currently on the SCDOT Geotechnical On-Call Contract. Contact the RCE for the list of GEC firms or see the SCDOT website for the current list of Geotechnical On-Call Contracts. Document the GEC's experience in providing instrumentation services using a VW-DCC cell in accordance with the plans and this STS by providing a project summary, of at least 3 projects, that includes the following information:
  - i. Project name, location, and completion date.
  - ii. Current contact information (address, phone number, and E-mail address) of project owner, designer, geotechnical consultant, and contract manager.
  - iii. Role in providing instrumentation services.
  - iv. Type of VW-DCC
  - v. Duration of the project including dates.

3.1.6 Ensure that a representative of the manufacturer/supplier will also be on-site during the initial installation of the VW-DCC to ascertain that all instruments have been connected correctly. The manufacturer/supplier shall also be available, via phone or E-mail, for questions from either the GEC responsible for maintaining the VW-DCC or from the Department concerning the data being collected.

**3.3 Working Drawing:** The Working Drawing shall contain the location of VW-DCC if different from the locations indicated in the plans. Provide written explanation of why the VW-DCC has to be relocated from the locations indicated in the plans with the Working Drawing. Note that a Working Drawing is not required if the VW-DCC is installed at the locations indicated on the plans. Submit Working Drawings for review in accordance with the requirements provided in **SCDOT Standard Operating Procedure (SOP) XX**. Submit the Working Drawings no later than 30 calendar days prior to installation of the VW-DCC(s). Failure to follow the requirements of the Plans, Specifications or this STS may cause delay in processing the submittals. Any subsequent loss of construction time due to failure to follow the requirements as indicated will not be accepted by the Department as a valid reason to change the project's completion date or provide the Contractor with additional time. Do not begin installation of the VW-DCC until the reviewed Working Drawings have been stamped and distributed by the Department for construction. Review and acceptance will be in accordance with **SCDOT SOP XX**.

**3.4 Submittal Reviews:** Approval of the personnel qualifications and installation plan by the Department shall not relieve the Contractor of its responsibility to successfully install the VW-DCC in accordance with the plans, specifications and this STS. Approval by the Department of the VW-DCC installation and instrumentation plan is contingent upon satisfactory demonstration that the instrumentation is meeting the objectives of the Department's GIMP. If, at any time, the RCE considers that the method of installation or monitoring does not produce satisfactory results, alter the method and/or equipment as necessary to comply with this STS and Department's GIMP. The Department will be the sole judge in determining the adequacy of the Contractor's installation and monitoring results and whether monitoring can be discontinued.

#### **4.0 CONSTRUCTION REQUIREMENTS**

**4.1 Delivery, Storage, and Handling:** Check all materials and equipment upon delivery to ensure that the proper items are received and are not damaged. Upon receipt of the VW-DCC, submit copies of the calibration sheets and manufacturer's installation and instruction manual for review and acceptance by the Geotechnical Engineer-of-Record (GEOR). In addition, make available the VW-DCC for inspection by the RCE and/or the GEOR. Store and maintain the VW-DCC in a clean, secure location until the VW-DCC is ready for installation.

**4.2 VW-DCC Installation:** Notify the RCE at least 14 days prior to the installation of VW-DCC.

**4.3** Locate all VW-DCCs in the field and ensure that no conflicts exist between the VW-DCC and foundations, structures, utilities or other construction proposed or present at the site.

**4.4** Install the VW-DCC using the sequence of construction provided in the GIMP or on the plans. Ensure a firm base on which heavy equipment and/or other necessary equipment can be operated safely under its own power for installation of the VW-DCC.

**4.5** Install the VW-DCC in accordance with the manufacturer's recommendations as presented in the manufacturer's instruction and installation manual. The VW-DCC will be connected to the individual instruments in accordance with the plans, contract documents, and manufacturer's recommendations.

**4.6** Within 1 week following installation, submit an installation record for each VW-DCC, which includes the instrumentation identification as provided in the plans, station/alignment, offset, and elevation of the VW-DCC. Locate the VW-DCC to an accuracy of  $\pm 0.01$  feet (both vertically and horizontally).

**4.7** Protect VW-DCC locations from damage and vandalism for the duration of the Contract and repair or replace damaged or inoperative VW-DCC at no cost to the Department.

**4.8 Abandonment of VW-DCC:** Once the RCE has determined that the VW-DCC is no longer required, abandon in-place all cables going from the VW-DCC to individual instruments. Remove any recoverable parts of the VW-DCC. All recoverable instrumentation is the property of the Contractor. Remove no more than 2 feet of the conduit that extends into the embankment and seal the conduit left in-place within the embankment using a lean grout mix (i.e.,  $f'_c = 1,500$  psi or less).

## **5.0 METHOD OF MEASUREMENT**

**5.1** The number of VW-DCC provided in the plans, will be paid for at the contract unit price bid for "Vibrating Wire Data Collection Center" which includes, but is not limited to, all labor, materials, and equipment necessary to install a vibrating wire data collection center along with data as outlined in the GIMP. Payment will not be made for VW-DCC that malfunction or are rejected for their inability to perform, or do not meet the requirements in the plans and these specifications.

## 6.0 BASIS OF PAYMENT

6.1 The price and payment for this work shall be full compensation for furnishing the necessary data logging system, enclosure, protection from vandalism and construction equipment, data as outlined in the GIMP, and incidental items based on the successful implementation of the VW-DCC system.

6.2 Payments shall be made under:

<b>Item No.</b>	<b>Pay Item</b>	<b>Pay Unit</b>
2038150	Vibrating Wire Data Collection Center	EA