

SECTION 35 20 23.

MECHANICAL DREDGE SILENT INSPECTOR

PART 1 GENERAL

1.1 DESCRIPTION

The work under this contract requires use of the Silent Inspector (SI) System to monitor removal and relocation of material, and report and manage the data. This performance based specification identifies required output and precision and instrumentation requirements. The requirements may be satisfied using equipment and technical procedures selected by the Contractor.

1.2 SUBMITTALS

Government approval is required for submittals with a “G” designation; submittals not having a “G” designation are for information only. When used, a designation following the “G” designation identifies the office that responsible for review of the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00, “SUBMITTAL PROCEDURES”:

SD-01 Preconstruction Submittals

Dredge Plant Instrumentation Plan; G, SAM-OP-J

SD-07 Certificates

Letter of Silent Inspector Certification; G, OP

1.3 PAYMENT

No separate payment will be made for installation, operation and maintenance of the SI system as specified herein for the duration of the dredging operations; all costs in connection therewith will be considered a subsidiary obligation of the Contractor and covered under the contract unit prices in the bidding schedule.

1.4 SILENT INSPECTOR CERTIFICATION

The Contractor is required to have a current Silent Inspector Certification for the dredge SI system used under this contract, at the time of issuance of Notice to Proceed. Certification shall be based on an on-site dredge inspection conducted by Silent Inspector Support Center personnel.

The Inspection shall include:

- A series of data quality checks as described in paragraph 3.5 “Compliance Inspection and Quality Assurance Checks”,
- Verification of data acquisition and transfer (Paragraph 3.2),
- Review of the Dredge Plant Instrumentation Plan (DPIP) as described in Paragraph 1.5

A Silent Inspector Certification is valid for one year from the date of certification. The owner or operator of the dredge shall contact the SI Support Center at 1-877-840-8024 on an annual basis to schedule re-inspection, allowing ample time for recertification, and coordinate this with all local authorities. The Contractor shall have personnel, who are familiar with the SI system instrumentation and have the expertise to recalibrate sensors, on site during the inspection. Re-inspection is required for any yard work which changes sensor type or location. These changes will be reported in the sensor log section of the DPIP. If the SI system has been disabled or turned off, re-calibration of all sensors and concurrent re-certification will be required. This is not to be construed that data must be continually transmitted if the dredge is between jobs or engaged in a non-government project which does not require certification.

#### 1.5 DREDGE PLANT INSTRUMENTATION PLAN (DPIP)

The Contractor shall have a DPIP on file with the National SI Support Team. This document shall describe how sensor data will be collected, how quality control on the data will be performed, and how sensors/data reporting equipment will be calibrated and repaired if they fail. A description of computed dredge specific data and how the sensor data will be transmitted to the Silent Inspector Database shall also be included. The Contractor shall submit to the SI Support Center any addendum or modifications made to the plan subsequent to its original submission, prior to Notice to Proceed. The Contractor shall also maintain a copy of the DPIP on the dredge which is readily accessible to Government personnel at all times.

The DPIP shall include the following as a minimum:  
*(DPIP must have table of context in the following order)*

- Dredging Company
  - Dredge Point of Contact
  - Phone Number
- Dredge Monitoring System Provider
  - Dredge Monitoring System Point of Contact
  - Telephone Number
- Dredge Name/ID
- Methods for sensor repair, replacement, installation, modification or calibration
- Data reporting equipment

- Procedure for providing sensor data/computed data to SI Database via e-mail
- System telemetry
- Dimensioned Drawings of the Dredge
  - Typical plan and profile view of the dredge showing:
    - Locations of required sensors referenced to:
      - fore and aft perpendicular and/or bucket teeth and pivot.
      - each other
    - overall dredge and bucket dimensions
- Description of how the UTC time stamp is collected
- Positioning system
  - Brand name and specifications
  - Sampling rates for data acquisition
  - Any calculation done external to the instrumentation
  - Certificates of calibration and/or manufacturer certificates of compliance
- Vertical correction
  - Description of how tidal/river stage information is entered into the data string.
- Bucket Depth
  - Brand name and specifications for instrumentation
  - Sampling rates for data acquisition
  - Any calculation done external to the instrumentation
  - Certificates of calibration and/or manufacturer certificates of compliance
  - Method used to zero the instrumentation at the surface of the water
- Bucket Characteristics
  - Bucket types
  - Number of buckets
  - Capacity
- Bucket Status
  - Criteria and methods used for determining dig/dump
  - Any associated instrumentation specifications
- Contractor Data
  - Backup frequency
  - Backup method
  - Post processing
- Archive capability
- Documentation of :
  - Test methods used by the contractor to provide quality control of data
  - Verification that the reported values are applicable for the sensor and application

- Log of sensor performance and modifications
- End of job data archive log

Any changes to the computation methods during the dredging contract shall be approved by the Silent Inspector Support Center prior to their implementation.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

### 3.1 SPECIFICATIONS FOR REPORTED DATA

The contractor shall provide, operate and maintain all hardware and software to meet these specifications. The Contractor shall be responsible for replacement, repair and calibration of sensors and other necessary data acquisition equipment needed to supply the required data.

Repairs shall be completed within 48 hours of any system/sensor failure. Upon completion of a repair, replacement, installation, modification or calibration the Contractor shall notify the Contracting Office's Representative. The Contracting Office's Representative may request re-calibration of sensors or other hardware components at any time during contract execution as deemed necessary.

The Contractor shall keep a log of sensor repair, replacement, installation, modification and calibration in the dredge's onboard copy of the DPIP. The log shall contain a three-year history of sensor maintenance which includes: the time of sensor failures (and subsequent repairs), the time and results of sensor calibrations, the time of sensor replacements, and the time that backup sensor systems are initiated to provide required data. It shall also contain the name of the person responsible for the sensor work. Only sensors that affect the data reported in paragraph 3.3.6, "Reporting Data Metadata", are affected by this logging requirement.

#### 3.1.1 Date and time

The date and time shall be reported to the nearest second and referenced to UTC time based on a 24 hour format. The reported time is the time the measurements were taken.

#### 3.1.2 Horizontal Positioning of the Bucket

Horizontal positioning of the bucket shall be obtained using a positioning system operating with a minimum accuracy level of 1 to 3 meters horizontal Circular Error Probable (CEP). Position shall be reported as Latitude/Longitude WGS 84.

### 3.1.3 Vertical Correction

Vertical correction data shall be obtained using appropriate equipment to give the water level with an accuracy of  $\pm 0.1$  feet and a resolution of 0.01 feet. Elevation values for tide or river-stage above the project datum described in the dredging specification shall be entered with a positive sign, and those below project datum shall be entered with a negative sign.

### 3.1.4 Bucket Depth *(optional on jobs of less than 200,000 cyds unless material conditions warrant)*

The bucket depth shall be the distance from the surface of the water to the teeth of the bucket when closed. An accuracy of  $\pm 0.5$  feet with values recorded to the nearest 0.1 feet. The values will be positive below the surface and negative above the surface of the water. If accuracy is not able to be maintained out of the water, depths shall be reported as "Null".

### 3.1.5 Target Depth

The target depth is the depth below the surface of the water that has been computed to dredge to. This shall be recorded to the nearest 0.1 feet. Data will be relative to the water surface.

### 3.1.6 Bucket Status

Dig/Dump condition of bucket status shall be obtained. The dig condition would be when the bucket contains material and dump condition means the bucket does not contain material.

### 3.1.7 Bucket Volume

The volume of the bucket shall be reported in cubic yards. If the bucket is changed during a job then the bucket volume should change accordingly.

### 3.1.8 Bucket Type

The bucket type shall be listed in the data as a string. Examples of bucket types are Clam Shell, Environmental, Excavator and Dragline.

## 3.2 DATA MONITORING

Onboard sensors will continually monitor dredge conditions, operations and efficiency and route this information into the shipboard dredge-specific system computer (DSS) to assist in guiding dredge operations. Portions of this Contractor-collected information shall be transmitted to the SI Database via the

internet, but the Contracting Officer's Representative shall also have access to a visual display of the DSS computer's operational screen onboard the dredge.

### 3.2.1 Data Monitoring Computer Display

The contractor shall provide a separate monitor for the Contracting Officer's Representative, at a minimum displaying the dredge production information required within this specification. The monitor shall be in a dry, enclosed area aboard or nearby the dredge, separate from the operator's cab, and located in a position suitable for data viewing to the satisfaction of the Contracting Officer's Representative..

### 3.3 DATA REPORTING REQUIREMENTS

Contractor collected information shall be transmitted to the SI Database. The parameters which shall be reported to the SI Database include: date and time, bucket position and status, vertical correction and datum, bucket depth\* and bucket characteristics.

*\* optional on jobs less than 200,000 cyds depending on material*

#### 3.3.1 Data Reporting Interface

The contractor may select any commercial satellite, cellular phone, or other data communications systems available to transmit the data to the SI Database via the Internet in the required mail message format. The data transition process from the dredge to the SI Database must be automated. The data may be sent from the dredge directly to the SI Database or to a shore based computer. Data transmitted to the SI Database should be raw data; any processing of the data conducted shore side shall be done using an automated software or programming routine. As per section 1.5, a description of this process shall be included in the DPIP.

#### 3.3.2 Data Measurement Frequency

Data shall be logged as a series of events. Each event will consist of a data set containing dredge information as per section 3.1. There are two types of triggers for an event; dig/dump condition change and time lapse since last event. The time lapse trigger is 5 minutes since the last event. A standard data string should be recorded within one second of an event trigger.

#### 3.3.3 Data Reporting

The system shall report this event history via Simple Mail Transport Protocol (SMTP) e-mail message to the SI Database Server. For this contract data will be reported \_\_\_\_\_ on a load basis (all data collected since last transmission sent at the completion of loading a scow) – **OR** - at regular intervals

such that the time from when the data is collected until the time it is reported does not exceed 6 – **OR**- 12 – **OR** - 24 hours.

The dredge shall continuously transmit data to the SI Database from mobilization until the final post-dredging survey has been accepted by the USACE.

### 3.3.4 Mail Message Format

The Simple Mail transport Protocol (Internet FRC 2821) shall be used to report data to the SI Database. The mail message shall have the following contents (Internet RFC 2822):

To: sidatatransfer@usace.army.mil  
From: contractor's email address  
Subject: SISDATA Transfer  
Attachment: SI MDATA html file

Mail message start of body  
SIMDATA  
SI Mech Data Transfer  
Blank line

Optional additional annotations from the Contractor – all data after the blank line are ignored.

End of message

### 3.3.5 Mail Attachment File Format

The attached data file shall be a MIME encoded (Internet RFC 2045) Extensible HyperText Markup Language (W3C standard XHTML 1.1) document. Any length of data may be included, but the file attachment size should not exceed six Megabytes. Only the html, table, tr, th, td, h2, h3 and body tags are permissible. The attached file may be compressed as a zip file.

Line Breaks and spaces are added for readability here, but the carriage return, line feed character combination is only added to delineate records (MECH\_DREDGING\_DATA tag) for actual data transmission.

```
<?xml version="1.0"?>
<MECH_DREDGING_DATA>
<DREDGE_NAME> string </DREDGE_NAME>
<MECH_DATA_RECORD>
<DATE_TIME> time date string </DATE_TIME>
<BUCKET_X coord_type = "(LL)"> floating point string </BUCKET_X>
<BUCKET_Y coord_type = "(LL)"> floating point string </BUCKET_Y>
<VERT_CORRECTION> floating point string </VERT_CORRECTION>
```

<BUCKET\_DEPTH>floating point string</BUCKET\_DEPTH>  
 <TARGET\_DEPTH> floating point string </TARGET\_DEPTH>  
 <BUCKET\_STATUS> bucket status string </BUCKET\_STATUS>  
 <BUCKET\_VOL> floating point string </BUCKET\_VOL>  
 <BUCKET\_TYPE> bucket type string </BUCKET\_TYPE>  
 </MECH\_DATA\_RECORD>  
 </MECH\_DREDGING\_DATA>  
 Carriage return – ASCII value 13  
 Line Feed – ASCII value 10

### 3.3.6 Reporting Metadata

Data shall be reported to the SI database using the tags and criteria specified in the following table:

Data Tag	Tag Notes
BUCKET_X	Longitude in decimal degrees. West Longitude values are reported as negative. The attribute coord_type shall be LL. See section 3.1.2
BUCKET_Y	Latitude values are to be reported in decimal degrees. Northerly Latitude values are reported as positive. The attribute coord_type shall be LL . See section 3.1.2
DATE_TIME	mm/dd/yyyy hh:mm:ss defined as UTC time of the measurement. All of the measurements should have occurred within one second of this reported time. See section 3.1.1
VERT_CORRECTION	Water level elevation reported in feet; positive above project datum, negative below. See section 3.1.3
BUCKET_DEPTH	Bucket bite depth reported in feet. Depth values are positive below the water surface. See section 3.1.4
TARGET_DEPTH	Target bucket bite depth reported in feet. Depth values are positive below the water surface. See section 3.1.5
BUCKET_STATUS	Dig/Dump status of the bucket. See section 3.1.6
BUCKET_VOL	Volume of the currently used bucket reported in cyds. See Sec 3.1.7
BUCKET_TYPE	String describing bucket type currently in use, example; Clamshell, Environmental, Excavator, Dragline, etc... See Sec 3.1.8

### 3.3.7 Contractor Data Backup

The contractor shall maintain an archive of all data sent via SMTP to the SI Database. The Contracting Officer's Representative may require (at no increase to the contract price) that the Contractor provide a copy of these data covering specified time periods. The data shall be provided on PC format USB flash drive, CD-ROM , file transfer protocol (ftp) upload, or other storage medium acceptable to the Contracting Officer's

Representative. At the end of the dredging contract the Contractor is responsible for contacting the national SI Support Center prior to discarding the data to ensure all data have been appropriately archived. The person who made the call, the date of the call, and the representative who gave permission to discard the data should be recorded in a separate section at the end of the Contractor's copy of the DPIIP.

### 3.3.8 Data Reporting Example

```
<?xml version="1.0"?>
<MECH_DREDGING_DATA>
<DREDGE_NAME>Gov 1</DREDGE_NAME>
<MECH_DATA_RECORD>
  <DATE_TIME>04/11/2006 13:12:05</DATE_TIME>
  <BUCKET_X coord_type = "LL">10.123345</BUCKET_X>
  <BUCKET_Y coord_type = "LL">-80.123333</BUCKET_Y>
  <VERT_CORRECTION>-0.1</VERT_CORRECTION>
  <BUCKET_DEPTH>55.10</BUCKET_DEPTH>
  <TARGET_DEPTH>55.10</TARGET_DEPTH>
  <BUCKET_STATUS>Dig</BUCKET_STATUS>
  <BUCKET_VOL>30</BUCKET_VOL>
  <BUCKET_TYPE>Clamshell</BUCKET_TYPE>
</MECH_DATA_RECORD>
</MECH_DREDGING_DATA>
<br>
</f>
```

## 3.4 PERFORMANCE REQUIREMENTS

The Contractor's Silent Inspector system shall be fully operational at the start of the dredging operations. To meet contract requirements for operability, the Contractor's system shall provide a minimum 85 percent data return and be 95 percent compliant with DPIIP requirements. Data return percentage is defined as the total number of quality records sent, divided by the total possible number of records that could be sent by a system in good working order. Quality data strings are considered to be those providing accurate values for at least 8 of the 9 parameters reported. DPIIP compliance is determined by percent of items listed in section 1.5 to be at minimum compliance. After fifty percent project completion, combined percentage of data return and DPIIP compliance should equal 95 percent or better. If repairs necessary to restore the required percent data return are not made within 48 hours, or if the Contractor fails to report required data within the specified time window for dredge measurements (see paragraph 3.3.2 "Data Measurement Frequency" & 3.3.3 "Data Reporting"); the system will be declared not fully operational, and the Contractor will be assessed liquidated damages equivalent to the additional oversight hours that would be required for Corps personnel to be on site from the first full day after the system is deemed not

operational through to the time when the system is returned to operational status. For this contract, the liquidated damages shall be \$\_\_\_\_\_ per day.

### 3.5 COMPLIANCE INSPECTION AND QUALITY ASSURANCE CHECKS

Quality assurance checks are required prior to the commencement of dredging, and at the discretion of the Contracting Officer's Representative periodically throughout the duration of the contract.

#### 3.5.1 Bucket Status Check

The Contracting Officer's Representative will document the status of the bucket used to determine the Dig/Dump condition of the dredge.

#### 3.5.2 Bucket Depth Check

The Contracting Officer's Representative may require periodic calibration checks of the reported bucket depth over a calibration point at the project site. The Contracting Officer's Representative may also use direct means such as tape measures, sounding lines, and pressure sensors to directly measure bucket depth. The Contractor shall have on the dredge a clearly readable steel tape, chain, or wire graduated to a minimum of 1 foot increments. This tape or chain shall be capable of measuring the depth below water surface of the low fixed point of the bucket with sufficient length to measure 5 feet below the maximum project depth. The Contracting Officer's Representative will review the bucket depth data to insure that the system is operating within acceptable accuracy, directing the contractor to re-calibrate or repair system components as necessary. Calibration delays are at the contractor's expense and do not warrant reimbursable time or cost by the government.

#### 3.5.3 Position Check

During inspection the reported bucket position will be verified by comparison with readings from a handheld GPS receiver. Throughout the contract, the Contracting Officer's Representative will periodically verify positions by comparing readings from an independent GPS.

### 3.6 LIST OF ITEMS PROVIDED BY THE CONTRACTOR

DPIP	Sec 1.4 Dredge Plant Instrumentation Plan
SI SYSTEM	
Sensor Instrumentation	Sec. 3.1 Specifications for Reported Data
Computer Monitor	Sec. 3.2.1 Data Monitoring Computer

Display

DREDGE DATA

Event documentation

Data reports

Sec. 3.3.2 Data Measurement Frequency

Sec. 3.3.3 Data Reporting

QA EQUIPMENT ON DREDGE

Bucket depth chain

Sec. 3.5.2 Bucket Depth Check