

## SECTION 01 45 00.00 20

## CONSTRUCTION QUALITY CONTROL

**04/07**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 52.2 (1999) Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

ASTM INTERNATIONAL (ASTM)

ASTM D 6245 (1998; R 2002) Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation

ASTM D 6345 (1998; R 2004) Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1507 (1995) IAQ Guidance for Occupied Buildings under Construction

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2003) Safety -- Safety and Health Requirements

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED (2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC)

LEED Reference Guide (2005) LEED-NC Reference Guide for New Construction

## 1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Quality Control (QC) Plan; G

Submit a Construction QC Plan prior to start of construction.

Indoor Air Quality (IAQ) Management Plan; G; (LEED)

#### SD-11 Closeout Submittals

Training Outline; G

Training Video Recording G

Validation of Training Completion; G;

### 1.3 INFORMATION FOR THE CONTRACTING OFFICER

Deliver the following to the Contracting Officer during Construction:

- a. CQC Report: Submit the report electronically by 10:00 AM the next working day after each day that work is performed.
- b. Contractor Production Report: Submit the report electronically by 10:00 AM the next working day after each day that work is performed.
- c. Preparatory Phase Checklist: Submit the report electronically in the same manner as the CQC Report. Original attached to the original CQC Report and one copy attached to each QC Report copy.
- d. Initial Phase Checklist: Submit the report electronically in the same manner as the CQC Report. Original attached to the original CQC Report and one copy attached to each QC Report copy.
- e. Field Test Reports: Within two working days after the test is performed, submit the report as an electronic attachment to the CQC Report. Mail or hand-carry the original within two working days after the test is performed, attached to the original CQC Report and one copy attached to each QC Report copy.
- f. Monthly Summary Report of Tests: Submit the report as an electronic attachment to the CQC Report at the end of each month. Mail or hand-carry the original attached to the last QC Report of the month.
- g. Testing Plan and Log: Submit the report as an electronic attachment to the CQC Report, at the end of each month. Mail or hand-carry the original attached to the last CQC Report of each month and one copy attached to each CQC Report copy.
- h. Rework Items List: Submit lists containing new entries daily, in the same manner as the CQC Report. Mail or hand-carry the original attached to the last CQC Report of each month and one copy attached to each CQC Report copy.
- i. CQC Meeting Minutes: Within two working days after the meeting is held, submit the report as an electronic attachment to the CQC Report.

Mail or hand-carry the original within two working days after the meeting is held, attached to the original CQC Report and one copy attached to each CQC Report copy.

j. QC Certifications: As required by the paragraph entitled "QC Certifications."

#### 1.4 QC PROGRAM REQUIREMENTS

Establish and maintain a QC program as described in this section. This QC program is a key element in meeting the objectives of NAVFAC Commissioning. The QC program consists of a QC Organization, QC Plan, QC Plan Meeting(s), a Coordination and Mutual Understanding Meeting, QC meetings, three phases of control, submittal review and approval, testing, completion inspections, and QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with the requirements of this Contract. The QC program shall cover on-site and off-site work and shall be keyed to the work sequence. No construction work or testing may be performed unless the QC Manager is on the work site. The QC Manager shall report to an officer of the firm and shall not be subordinate to the Project Superintendent or the Project Manager. The QC Manager, Project Superintendent and Project Manager must work together effectively. Although the QC Manager is the primary individual responsible for quality control, all individuals will be held responsible for the quality of work on the job.

##### 1.4.1 Acceptance of the Construction Quality Control (QC) Plan

Acceptance of the QC Plan is required prior to the start of construction. The Contracting Officer reserves the right to require changes in the QC Plan and operations as necessary, including removal of personnel, to ensure the specified quality of work. The Contracting Officer reserves the right to interview any member of the QC organization at any time in order to verify the submitted qualifications. All QC organization personnel shall be subject to acceptance by the Contracting Officer. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements specified in the Contract.

##### 1.4.2 Preliminary Construction Work Authorized Prior to Acceptance

The only construction work that is authorized to proceed prior to the acceptance of the QC Plan is mobilization of storage and office trailers, temporary utilities, and surveying.

##### 1.4.3 Notification of Changes

Notify the Contracting Officer, in writing, of any proposed changes in the QC Plan or changes to the QC organization personnel, a minimum of 10 work days prior to a proposed change. Proposed changes shall be subject to acceptance by the Contracting Officer.

#### 1.5 QC ORGANIZATION

##### 1.5.1 QC Manager

###### 1.5.1.1 Duties

Provide a QC Manager at the work site to implement and manage the QC

program. In addition to implementing and managing the QC program, the QC Manager may perform the duties of Project Superintendent unless otherwise specified in the individual task order. The QC Manager shall not be designated as the safety competent person as defined by EM 385-1-1. The QC Manager is required to attend the partnering meetings, QC Plan Meetings, Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the three phases of control, perform submittal review and approval, ensure testing is performed and provide QC certifications and documentation required in this Contract. The QC Manager is responsible for managing and coordinating the three phases of control and documentation performed by testing laboratory personnel and any other inspection and testing personnel required by this Contract. The QC Manager is the manager of all QC activities.

#### 1.5.1.2 Qualifications

An individual with a minimum of 5 years combined experience in the following positions: Project Superintendent, QC Manager, Project Manager, Project Engineer or Construction Manager on similar size and type construction contracts which included the major trades that are part of this Contract. The individual must be familiar with the requirements of EM 385-1-1, and have experience in the areas of hazard identification, safety compliance, and sustainability.

#### 1.5.2 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager shall have completed the course entitled "Construction Quality Management (CQM) for Contractors." If the QC Manager does not have a current certification, they shall obtain the CQM for Contractors course certification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer for information on the next scheduled class.

#### 1.5.3 Alternate QC Manager Duties and Qualifications

Designate an alternate for the QC Manager at the work site to serve in the event of the designated QC Manager's absence. The period of absence may not exceed two weeks at one time, and not more than 30 workdays during a calendar year. The qualification requirements for the Alternate QC Manager shall be the same as for the QC Manager.

### 1.6 QUALITY CONTROL (QC) PLAN

#### 1.6.1 Construction Quality Control (QC) Plan

##### 1.6.1.1 Requirements

Provide, for acceptance by the Contracting Officer, a Construction QC Plan submitted in a three-ring binder that includes a table of contents, with major sections identified with tabs, with pages numbered sequentially, and that documents the proposed methods and responsibilities for accomplishing commissioning activities during the construction of the project:

I. QC ORGANIZATION: A chart showing the QC organizational structure.

II. NAMES AND QUALIFICATIONS: Names and qualifications, in resume format, for each person in the QC organization. Include the CQM for

Contractors course certifications for the QC Manager and Alternate QC Manager as required by the paragraphs entitled "Construction Quality Management Training" and "Alternate QC Manager Duties and Qualifications".

III. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL: Duties, responsibilities, and authorities of each person in the QC organization.

IV. OUTSIDE ORGANIZATIONS: A listing of outside organizations, such as architectural and consulting engineering firms, that will be employed by the Contractor and a description of the services these firms will provide.

V. APPOINTMENT LETTERS: Letters signed by an officer of the firm appointing the QC Manager and Alternate QC Manager and stating that they are responsible for implementing and managing the QC program as described in this Contract. Include in this letter the responsibility of the QC Manager and Alternate QC Manager to implement and manage the three phases of control, and their authority to stop work which is not in compliance with the Contract. Copies of the letters shall be included in the QC Plan.

VI. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER: Procedures for reviewing, approving, and managing submittals. Provide the name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to approval. Provide the initial submittal of the Submittal Register as specified in section 01 33 00 SUBMITTAL PROCEDURES.

VII. TESTING LABORATORY INFORMATION: Testing laboratory information required by the paragraphs entitled "Accreditation Requirements", as applicable.

VIII. TESTING PLAN AND LOG: A Testing Plan and Log that includes the tests required, referenced by the specification paragraph number requiring the test, the frequency, and the person responsible for each test. Use Government forms to log and track tests.

IX. PROCEDURES TO COMPLETE REWORK ITEMS: Procedures to identify, record, track, and complete rework items. Use Government WebCM forms to record and track rework items.

X. DOCUMENTATION PROCEDURES: Use Government WebCM form.

XI. LIST OF DEFINABLE FEATURES: A Definable Feature of Work (DFOW) is a task that is separate and distinct from other tasks and has control requirements and work crews unique to that task. A DFOW is identified by different trades or disciplines and is an item or activity on the construction schedule. The list of DFOWs shall include, but not be limited to, all critical path activities on the NAS. Include all activities for which this specification requires QC Specialists or specialty inspection personnel. Each design development stage and submittal package shall have separate DFOWs in the Network Analysis Schedule.

XII. PROCEDURES FOR PERFORMING THE THREE PHASES OF CONTROL: Identify procedures you will use to ensure the three phases of control are used to manage the quality on this project. For each DFOW, a Preparatory and Initial phase checklist will be filled out during the Preparatory

and Initial phase meetings. The checklist(s) will then also be entered in WebCM. The Preparatory and Initial Phases and meetings shall be conducted with a view towards obtaining quality construction by planning ahead and identifying potential problems for each DFOW.

#### 1.7 QC PLAN MEETINGS

Prior to submission of the QC Plan, the QC Manager will meet with the Contracting Officer to discuss the QC Plan requirements of this Contract. The purpose of this meeting is to develop a mutual understanding of the QC Plan requirements prior to plan development and submission and to agree on the Contractor's list of DFOWs.

#### 1.8 COORDINATION AND MUTUAL UNDERSTANDING MEETING

After submission of the QC Plan, and prior to the start of construction, the QC Manager will meet with the Contracting Officer to present the QC program required by this Contract. When a new QC Manager is appointed, the coordination and mutual understanding meeting shall be repeated.

##### 1.8.1 Purpose

The purpose of this meeting is to develop a mutual understanding of the QC details, including documentation, administration for on-site and off-site work, environmental requirements and procedures, coordination of activities to be performed, and the coordination of the Contractor's management, production, and QC personnel. At the meeting, the Contractor will be required to explain in detail how three phases of control will be implemented for each DFOW, as well as how each DFOW will be affected by each management plan or requirement as listed below:

- a. Waste Management Plan.
- b. IAQ Management Plan.
- c. Procedures for noise and acoustics management.
- d. Environmental Protection Plan.
- e. Environmental regulatory requirements.

##### 1.8.2 Coordination of Activities

Activities included in various sections shall be coordinated to assure efficient and orderly installation of each component. Coordinate operations included under different sections that are dependent on each other for proper installation and operation. Schedule construction operations with consideration for indoor air quality as specified in the IAQ Management Plan.

##### 1.8.3 Attendees

As a minimum, the Contractor's personnel required to attend shall include an officer of the firm, the Project Manager, Project Superintendent, QC Manager, and the Alternate QC Manager. Each subcontractor who will be assigned QC responsibilities shall have a principal of the firm at the meeting. Minutes of the meeting will be prepared by the QC Manager and signed by the Contractor and the Contracting Officer. The Contractor shall provide a copy of the signed minutes to all attendees and shall be included

in the QC Plan.

#### 1.9 QC MEETINGS

After the start of construction, the QC Manager shall conduct QC meetings once every two weeks at the work site with the Project Superintendent, the CA, and the foremen who are performing the work of the DFOWs. The QC Manager shall prepare the minutes of the meeting and provide a copy to the Contracting Officer within two working days after the meeting. The Contracting Officer may attend these meetings. As a minimum, the following shall be accomplished at each meeting:

- a. Review the minutes of the previous meeting;
- b. Review the schedule and the status of work and rework;
- c. Review the status of submittals;
- d. Review the work to be accomplished in the next two weeks and documentation required;
- e. Resolve QC and production problems (RFI, etc.);
- f. Address items that may require revising the QC Plan;
- g. Review Accident Prevention Plan (APP);
- h. Review environmental requirements and procedures;
- i. Review Waste Management Plan;
- j. Review IAQ Management Plan;
- k. Review Environmental Management Plan; and
- l. Review the status of training completion.

#### 1.10 THREE PHASES OF CONTROL

The Three Phases of Control shall adequately cover both on-site and off-site work and shall include the following for each DFOW.

##### 1.10.1 Preparatory Phase

Notify the Contracting Officer at least two work days in advance of each preparatory phase meeting. The meeting shall be conducted by the QC Manager and attended by the Project Superintendent, and the foreman responsible for the DFOW. When the DFOW will be accomplished by a subcontractor, that subcontractor's foreman shall attend the preparatory phase meeting. Document the results of the preparatory phase actions in the daily Contractor Quality Control Report and in the Preparatory Phase Checklist. Perform the following prior to beginning work on each DFOW:

- a. Review each paragraph of the applicable specification sections;
- b. Review the Contract drawings;
- c. Verify that field measurements are as indicated on construction and/or shop drawings before confirming product orders, in order to

minimize waste due to excessive materials;

d. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required;

e. Review the testing plan and ensure that provisions have been made to provide the required QC testing;

f. Examine the work area to ensure that the required preliminary work has been completed;

g. Coordinate the schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials;

h. Arrange for the return of shipping/packaging materials, such as wood pallets, where economically feasible;

i. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data;

j. Discuss construction methods, construction tolerances, workmanship standards, and the approach that will be used to provide quality construction by planning ahead and identifying potential problems for each DFW; and

k. Review the APP and appropriate Activity Hazard Analysis (AHA) to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted.

#### 1.10.2 Initial Phase

Notify the Contracting Officer at least two work days in advance of each initial phase. When construction crews are ready to start work on a DFW, conduct the initial phase with the Project Superintendent, and the foreman responsible for that DFW. Observe the initial segment of the DFW to ensure that the work complies with Contract requirements. Document the results of the initial phase in the daily CQC Report and in the Initial Phase Checklist. Repeat the initial phase for each new crew to work on-site, or when acceptable levels of specified quality are not being met. Perform the following for each DFW:

a. Establish the quality of workmanship required;

b. Resolve conflicts;

c. Ensure that testing is performed by the approved laboratory; and

d. Check work procedures for compliance with the APP and the appropriate AHA to ensure that applicable safety requirements are met.

#### 1.10.3 Follow-Up Phase

Perform the following for on-going work daily, or more frequently as necessary, until the completion of each DFW and document in the daily CQC Report:

- a. Ensure the work is in compliance with Contract requirements;
- b. Maintain the quality of workmanship required;
- c. Ensure that testing is performed by the approved laboratory;
- d. Ensure that rework items are being corrected; and
- e. Perform safety inspections.

#### 1.10.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same DFOW if the quality of on-going work is unacceptable, if there are changes in the applicable QC organization, if there are changes in the on-site production supervision or work crew, if work on a DFOW is resumed after substantial period of inactivity, or if other problems develop.

#### 1.10.5 Notification of Three Phases of Control for Off-Site Work

Notify the Contracting Officer at least two weeks prior to the start of the preparatory and initial phases.

#### 1.11 SUBMITTAL REVIEW AND APPROVAL

Procedures for submission, review and approval of submittals are described in Section 01 33 00 SUBMITTAL PROCEDURES.

#### 1.12 TESTING

Except as stated otherwise in the specification sections, perform sampling and testing required under this Contract.

##### 1.12.1 Accreditation Requirements

Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (E 329, C 1077, D 3666, D 3740, A 880, E 543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the Corporate Office.

##### 1.12.2 Laboratory Accreditation Authorities

Laboratory Accreditation Authorities include the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology at <http://ts.nist.gov/ts/htdocs/210/214/214.htm> , the American Association of State Highway and Transportation Officials (AASHTO) program at <http://www.transportation.org/aashto/home.nsf/frontpage> , International Accreditation Services, Inc. (IAS) at <http://www.iasonline.org>, U. S. Army Corps of Engineers Materials Testing Center (MTC) at <http://www.wes.army.mil/SL/MTC/>, and the American Association for Laboratory Accreditation (A2LA) program at <http://www.a2la.org/>.

### 1.12.3 Capability Check

The Contracting Officer retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this Contract.

### 1.12.4 Test Results

Cite applicable Contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. If the item fails to conform, notify the Contracting Officer immediately. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. Test results shall be signed by a testing laboratory representative authorized to sign certified test reports. Furnish the signed reports, certifications, and other documentation to the Contracting Officer via the QC Manager. Furnish a summary report of field tests at the end of each month, per the paragraph entitled "INFORMATION FOR THE CONTRACTING OFFICER".

### 1.12.5 Test Reports and Monthly Summary Report of Tests

The QC Manager shall furnish the signed reports, certifications, and a summary report of field tests at the end of each month to the Contracting Officer. Attach a copy of the summary report to the last daily Contractor Quality Control Report of each month. A copy of the signed test reports and certifications shall be provided to the OMSI preparer for inclusion into the OMSI documentation.

## 1.13 QC CERTIFICATIONS

### 1.13.1 CQC Report Certification

Each CQC Report shall contain the following statement: "On behalf of the Contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge, except as noted in this report."

### 1.13.2 Invoice Certification

Furnish a certificate to the Contracting Officer with each payment request, signed by the QC Manager, attesting that as-built drawings are current, coordinated and attesting that the work for which payment is requested, including stored material, is in compliance with Contract requirements.

### 1.13.3 Completion Certification

Upon completion of work under this Contract, the QC Manager shall furnish a certificate to the Contracting Officer attesting that "the work has been completed, inspected, tested and is in compliance with the Contract." A copy of this final QC Certification for completion shall be provided to the OMSI preparer for inclusion into the OMSI documentation.

## 1.14 COMPLETION INSPECTIONS

### 1.14.1 Punch-Out Inspection

Near the completion of all work or any increment thereof, established by a completion time stated in the Contract Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the QC Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings, specifications and Contract. Include in the punch list any remaining items on the "Rework Items List", which were not corrected prior to the Punch-Out Inspection. The punch list shall include the estimated date by which the deficiencies will be corrected. A copy of the punch list shall be provided to the Contracting Officer. The QC Manager, or staff, shall make follow-on inspections to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government "Pre-Final Inspection".

### 1.14.2 Pre-Final Inspection

The Government will perform this inspection to verify that the facility is complete and ready to be occupied. A Government "Pre-Final Punch List" may be developed as a result of this inspection. The QC Manager shall ensure that all items on this list are corrected prior to notifying the Government that a "Final" inspection with the Client can be scheduled. Any items noted on the "Pre-Final" inspection shall be corrected in a timely manner and shall be accomplished before the contract completion date for the work, or any particular increment thereof, if the project is divided into increments by separate completion dates.

### 1.14.3 Final Acceptance Inspection

The Contractor shall notify the Contracting Officer at least 14 calendar days prior to the date a final acceptance inspection can be held. The notice shall state that all items previously identified on the pre-final punch list will be corrected and acceptable, along with any other unfinished Contract work, by the date of the final acceptance inspection. The Contractor shall be represented by the QC Manager, the Project Superintendent, and others deemed necessary. Attendees for the Government will include the Contracting Officer, other ROICC personnel, and personnel representing the Client. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the Contract Clause entitled "Inspection of Construction."

## 1.15 TRAINING

Prior to acceptance of the facility by the Contracting Officer for beneficial occupancy, the Contractor shall provide a comprehensive project-specific Government personnel training program for the systems and equipment of the facility specified in the technical specifications of this Contract. The trainees shall include the Contracting Officer, facilities managers, maintenance staff, and building occupants. The Contractor shall be responsible for coordinating, scheduling, and ensuring that training is completed. Instructors shall be well-versed in the particular systems that they are presenting. Provide instruction time on site at a location

approved by the Contracting Officer.

#### 1.15.1 Training Plan

The Contractor shall submit a written training plan to the Contracting Officer for review and approval prior to training. The training shall be coordinated and scheduled with the Contracting Officer. The plan shall include the following elements:

- a. Equipment included in training.
- b. Intended audience.
- c. Location of training.
- d. Objectives.
- e. Subjects covered including description.
- f. Duration of training on each subject.
- g. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.).
- h. Instructor and instructor qualifications for each subject.

#### 1.15.2 Content

Training shall stress and enhance the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The core of this training will be based on manufacturer's recommendations and the operation and maintenance information provided as a part of this Contract. A review of environmentally-related aspects of the Operation and Maintenance Manuals shall be included. The course shall provide a brief summary of Part I, "Facility Information" and a more detailed presentation of Part II, "Primary Systems Information" from the operation and maintenance manuals provided under Section 01 78 23 OPERATION AND MAINTENANCE DATA. The presentation shall be weighted so as to spend 95 percent of instruction time on Part II. The following shall be included for each system:

- a. Use of O&M Manuals.
- b. Review of control drawings and schematics.
- c. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms.
- d. Interactions with other systems.
- e. Adjustments and optimizing methods for energy conservation.
- f. Relevant health and safety issues.
- g. Special maintenance and replacement sources.
- h. Tenant interaction issues.

- i. Discussion of how the feature or system is environmentally responsive.

#### 1.15.3 Training Outline

The Contractor will provide each trainee in the course a written course outline, listing the major and minor topics to be discussed by the instructor on each day of the course.

#### 1.15.4 Video Recording

Provide to the Contracting Officer two copies of the training course in DVD video recording format, and add one copy to the O&M manual data. The recording shall capture, in video and audio, all instructors' training presentations including question and answer periods with the trainees. Videotaping of the training sessions shall be provided by the Contractor.

#### 1.15.5 Unresolved Questions From Trainees

If, at the end of the training course, there are questions from trainees that remain unresolved, the instructor shall send the answers, in writing, to the Contracting Officer for transmittal to the trainees, and the training video should be modified to include the appropriate clarifications.

#### 1.15.6 Validation of Training Completion

Provide completed and signed validation of training forms as provided in the QC Plan for all training sessions accomplished. Provide two copies of the signed training validation forms to the Contracting Officer and one copy to the OMSI preparer for inclusion into the OMSI documentation.

### 1.16 DOCUMENTATION

Maintain current and complete records of on-site and off-site QC program operations and activities. The Contractor shall submit all documentation per Section 01322 WEB BASED CONSTRUCTION MANAGEMENT (WEB CM).

#### 1.16.1 Construction Documentation

Reports are required for each day that work is performed and shall accompany the submission of the Contractor Quality Control Report prepared for the same day. Maintain current and complete records of on-site and off-site QC program operations and activities. The forms identified under the paragraph "INFORMATION FOR THE CONTRACTING OFFICER" shall be used. Reports are required for each day work is performed. Account for each calendar day throughout the life of the Contract. Every space on the forms must be filled in. Use N/A if nothing can be reported in one of the spaces. The Project Superintendent and the QC Manager must prepare and sign the Contractor Production and CQC Reports, respectively. The reporting of work shall be identified by terminology consistent with the construction schedule. In the "remarks" sections of the reports, enter pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered and a record of visitors to the work site, quality control problem areas, deviations from the QC Plan, construction deficiencies encountered, meetings held. For each entry in the report(s), identify the Schedule Activity No. that is associated with the entered remark.

### 1.16.2 Quality Control Validation

Establish and maintain the following in a series of three ring binders. Binders shall be divided and tabbed as shown below. These binders shall be readily available to the Contracting Officer during all business hours.

- a. All completed Preparatory and Initial Phase Checklists, arranged by specification section.
- b. All milestone inspections, arranged by Activity Number.
- c. An up-to-date copy of the Testing Plan and Log with supporting field test reports, arranged by specification section.
- d. Copies of all contract modifications, arranged in numerical order. Also include documentation that modified work was accomplished.
- e. An up-to-date copy of the Rework Items List.
- f. Maintain up-to-date copies of all punch lists issued by the QC staff to the Contractor and Sub-Contractors and all punch lists issued by the Government.

### 1.16.3 Testing Plan and Log

As tests are performed, the QC Manager shall record on the "Testing Plan and Log" the date the test was performed and the date the test results were forwarded to the Contracting Officer. Attach a copy of the updated "Testing Plan and Log" to the last daily CQC Report of each month, per the paragraph "INFORMATION FOR THE CONTRACTING OFFICER". A copy of the final "Testing Plan and Log" shall be provided to the OMSI preparer for inclusion into the OMSI documentation.

### 1.16.4 Rework Items List

The QC Manager shall maintain a list of work that does not comply with the Contract, identifying what items need to be reworked, the date the item was originally discovered, the date the item will be corrected by, and the date the item was corrected. There is no requirement to report a rework item that is corrected the same day it is discovered. The Contractor shall be responsible for including those items identified by the Contracting Officer.

### 1.16.5 As-Built Drawings

The QC Manager is required to ensure the as-built drawings, required by Section 01 77 00.00 20 CLOSEOUT PROCEDURES are kept current on a daily basis and marked to show deviations which have been made from the Contract drawings. Ensure each deviation has been identified with the appropriate modifying documentation (e.g. PC No., Modification No., Request for Information No., etc.). The QC Manager shall initial each revision. Upon completion of work, the QC Manager shall furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the Contracting Officer.

### 1.17 NOTIFICATION ON NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected non-compliance with the Contract. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time for excess costs or damages by the Contractor.

### 1.18 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN

An IAQ Management Plan shall be submitted within 15 days after notice to proceed and not less than 10 days before the preconstruction meeting. Revise and resubmit Plan as required by the Contracting Officer. Copies of the final Plan shall be made available to all workers on site. Include provisions in the Plan to meet the requirements specified below and to ensure safe, healthy air for construction workers and building occupants.

#### 1.18.1 Requirements During Construction

Provide for evaluation of indoor Carbon Dioxide concentrations in accordance with [ASTM D 6245](#). Provide for evaluation of volatile organic compounds (VOCs) in indoor air in accordance with [ASTM D 6345](#). Use filters with a Minimum Efficiency Reporting Value (MERV) of 8 in permanently installed air handlers during construction.

##### 1.18.1.1 Control Measures

The Contractor shall meet or exceed the requirements of [SMACNA 1507](#), Chapter 3, to help minimize contamination of the building from construction activities. The five requirements of this manual which must be adhered to are described below:

- a. HVAC protection: Isolate return side of HVAC system from surrounding environment to prevent construction dust and debris from entering the duct work and spaces.
- b. Source control: Use low emitting paints and other finishes, sealants, adhesives, and other materials as specified. When available, cleaning products shall have a low VOC content and be non-toxic to minimize building contamination. Utilize cleaning techniques that minimize dust generation. Cycle equipment off when not needed. Prohibit idling motor vehicles where emissions could be drawn into building. Designate receiving/storage areas for incoming material that minimize IAQ impacts.
- c. Pathway interruption: When pollutants are generated use strategies such as 100 percent outside air ventilation or erection of physical barriers between work and non-work areas to prevent contamination.
- d. Housekeeping: Clean frequently to remove construction dust and debris. Promptly clean up spills. Remove accumulated water and keep work areas dry to discourage the growth of mold and bacteria. Take extra measures when hazardous materials are involved.

- e. Scheduling: Control the sequence of construction to minimize the absorption of VOCs by other building materials.

#### 1.18.1.2 Moisture Contamination

- a. Remove accumulated water and keep work dry.
- b. Use dehumidification to remove moist, humid air from a work area.
- c. Do not use combustion heaters or generators inside the building.
- d. Protect porous materials from exposure to moisture.
- e. Remove and replace items which remain damp for more than a few hours.

#### 1.18.2 Requirements after Construction

After construction ends and prior to occupancy, conduct a building flush-out or test the indoor air contaminant levels. Flush-out shall be a minimum two-week building flush-out with MERV-13 filtration media as determined by [ASHRAE 52.2](#) at 100 percent outside air, or in accordance with [LEED Reference Guide](#). Air contamination testing shall be consistent with EPA's current Compendium of Methods for the Determination of Air Pollutants in Indoor Air, and with the [LEED Reference Guide](#). After building flush-out or testing and prior to occupancy, replace filtration media. Filtration media shall have a MERV of 13 as determined by [ASHRAE 52.2](#).

### PART 2 PRODUCTS

Not used.

### PART 3 EXECUTION

#### 3.1 PREPARATION

Designate receiving/storage areas for incoming material to be delivered according to installation schedule and to be placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. Store and handle materials in a manner as to prevent loss from weather and other damage. Keep materials, products, and accessories covered and off the ground, and store in a dry, secure area. Prevent contact with material that may cause corrosion, discoloration, or staining.

Protect all materials and installations from damage by the activities of other trades.

-- End of Section --