**NOTE TO CRITERIA ARCHITECT & DCS PROJECT MANAGER:**

**This version is for a Major Capital Project authorized by the Commissioner to be a Design-Build Project.**

EDITING: To Show the Editing Notes in this MS Word document the show/hide symbol (¶) button must be must turned on in the MS Word Toolbar. To print this document show/hide symbol (¶) must be turned off in the MS Word Toolbar, this will enable the document to indicate the correct number of total pages. The below blue text are project specific information that must be completed by the Criteria Architect as applicable to the specific project. When complete change blue text to black text. The *bold and italicized text* is for example purposes only and must be modified and edited by the Criteria Architect to make it project specific. For text boxes, left click on Insert and then insert project specific information over the word Insert in the underlined space.

**TABLES:** To view the Table Grid in this MS Word document, click inside any table, then go to the **Table Tools > Layout** tab, **Table** group, and click **View Gridlines.**

HEADERS AND FOOTERS: The header and footer for each page of the Project Manual shall match the format, font (Arial), size (9 pt), font style (BOLD & CAPITALIZED) and line borders of the header and footer shown herein. The header of each page shall contain the Division 01 General Requirements, and the page number & number of pages as shown herein. The footer shall contain the project number in the right hand side as shown herein. Division 00 and 01 contain a revision date in the left side of the footer. This date is to remain as it is for DCS informational purposes only and should not be altered by the Criteria Architect.

SECTIONS, SUBSECTIONS, PARAGRAPHS: If a Section is not part of the project scope, delete the Section in the General Requirements, then check “NOT USED” in the Table of Contents. DO NOT delete the Section title from the Table of Contents.

If a Sub-Section is not applicable to the project, DO NOT delete the Sub-Section title from the General Requirements OR from the Table of Contents. Check “NOT USED” in the Table of Contents, and then state “NOT USED” beneath the Sub-Section Title in the General Requirements. Delete the contents of the Sub-Section.

Edit Paragraphs carefully to reflect specific project requirements, or delete them if they do not apply. DO NOT include Paragraphs or parts of Paragraphs in the project manual, which have no applicability to the specific project. KEEP IN NUMERICAL SEQUENCE.

DIVISION 00 SECTIONS contain the bidding documents as required by the Connecticut Department of Administrative Services (CT DAS) Procurement Services Unit and the Connecticut General Statutes. Any and all revisions to this section are the sole responsibility of the CT DAS Procurement Services Unit, and the Criteria Architect shall under no circumstances change these documents. The Criteria Architect is responsible to list these sections in the Project Manual Table of Contents.

GENERAL CONDITIONS: Please review the General Conditions carefully and coordinate the requirements of those Articles including the Definitions.

DIVISION 01 SECTIONS are the organizational key of the Project Manual. All revisions to this Division are the responsibility of the Criteria Architect. Division 01 must be closely coordinated with Division 00, Division 02 through 49, the Drawings, and Available Information.

LEED REQUIREMENTS: The “Division 01 General Requirements - Design -Build Capital Projects” include the Requirements for LEED & Commissioning. For D-B Capital Projects that DO NOT require LEED & Commissioning, the DCS PM and Criteria Architect must delete LEED & Commissioning sections designated in the Edit Notes, and then check “NOT USED” in the Table of Contents. DO NOT delete the Section title from the Table of Contents.

NOTES TO CRITERIA ARCHITECT, DCS PROJECT MANAGER, & USER AGENCY: The DCS PM, Criteria Architect, and User Agency must determine whether this Project must comply with the following requirements of CGS § 16a-38k:

1. Project is approved and funded on or after January 1, 2008;
2. New construction of a state facility that is projected to cost not less than five million dollars;
3. renovation of a state facility that is projected to cost not less than two million dollars, that is financed with state funds and is approved and funded on or after January 1, 2008,

**IMPORTANT NOTE REGARDING “HIDDEN TEXT”:**

Each document contains Editing Notes in the form of “hidden text”. The Editing Notes assist the Architect in modifying and editing the document to make it project-specific. In order to show the “hidden text”, click the **Home** tab, and in the **Paragraph** group, click the **Show/Hide** symbol (¶). **Turn off** the Show/Hide symbol (¶) **before printing the document** in order to indicate the correct number of pages. **DELETE THIS NOTE.**

**IMPORTANT NOTE REGARDING FORMATTING:**

Insert a blank page at the end of all *odd numbered* specification sections that states “THIS PAGE INTENTIONALLY LEFT BLANK”. **DELETE THIS NOTE.**

**01 40 00 QUALITY REQUIREMENTS**

* 1. **Summary:** Section 01 40 00 Quality Requirements contains the following Subsections:

|  |  |  |
| --- | --- | --- |
| **01 42 19** | **Reference Standards and Definitions** | **Not Used** |
| **01 45 00** | **Quality Control** | **Not Used** |
| **01 45 23** | **Testing For Indoor Air Quality, Baseline IAQ, & Materials NOTE:** If the specific project does not require LEED and/or Commissioning then **check** “**NOT USED**” in the 00 01 10 Table of Contents, **check “NOT USED”** in this *Section* Table of Contents, and **delete the contents of the sub-section** from the General Requirements | **Not Used** |

## 01 42 19 REFERENCE STANDARDS AND DEFINITIONS

NOTE: This Section 01 42 19 "Reference Standards and Definitions” includes requirements for compliance with reference standards used in the project manual and for requiring copies of standards at site and definitions of terms that are not defined in the general conditions.

Revise paragraphs carefully to reflect specific project requirements, or delete them if they do not apply.

### **A. Related Documents:** All Volumes of the Design-Build Request for Proposals for this Project, including, but not limited to, the D-B Agreement General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## B. Industry Standards:

### **1.** **Applicability of Standards:** Except where the D-B Request for Proposal Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the D-B Request for Proposal Documents to the extent referenced. Such standards are made a part of the D-B Request for Proposal Documents by reference.

NOTE: Retain paragraph below unless the entire specification is edited to insert dates (though this is not recommended) and un-referenced standards are not applicable. Revise the date established below to comply with project requirements.

### **2.** **Publication Dates:** Comply with the standards in effect as of the date of the D-B Request for Proposal Documents unless a specific date is indicated in the D-B Request for Proposal Documents or the governing regulations cited herein.

NOTE: Paragraph below may resolve problems that sometimes arise using reference standards.

### **3.** **Conflicting Requirements:** Where compliance with **two (2)** or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent and highest quality requirement. Request a decision from the Construction Administrator before proceeding on requirements that are different but apparently equal, and where it is uncertain which requirement is the most stringent.

#### **4.** **Minimum Quantity or Quality Levels:** The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Request a clarification from the Construction Administrator regarding uncertainties before proceeding.

### **5.** **Copies of Standards:** Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the D-B Request for Proposal Documents.

## C. Where copies of standards are needed to perform a required construction activity, the Design-Builder shall obtain copies directly from the publication source.

### **1.** **Abbreviations and Names:** Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications, D-B Request for Proposal Documents, or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Thompson Gale's "Encyclopedia of Associations," available in most libraries.

## D. Governing Regulations And Authorities:

NOTE: Criteria Architect shall amend dates of the below regulations based upon the date of the anticipated permit application date for the Project. projects.

**1. Copies of Regulations:** Obtain copies of the **“latest applicable State Codes”** and the following regulations and retain at the Project Site to be available for reference by parties who have a reasonable need during submittals, planning, and progress of the Work, until Substantial Completion.

**1.1** **Connecticut State Building Code** **-** [ Insert ].

**1.1.1** CT Supplement - [ Insert ].

**1.1.2** CT Amendments - [ Insert ].

**1.1.3** International Building Code - [ Insert ].

**1.1.4** International Existing Building Code - [ Insert ].

**1.1.5** International Mechanical Code - [ Insert ].

**1.1.6** International Plumbing Code - [ Insert ].

**1.1.7** International Energy Conservation Code - [ Insert ].

**1.1.8** National Electric Code (NFPA 70) - [ Insert ].

**1.1.9** ICC/ANSI A117.1-Accessible and Usable Buildings and Facilities - [ Insert ].

**1.2.** **Connecticut Fire Safety Code -** [ Insert ].

**1.2.1** CT Supplement - [ Insert ].

**1.2.2** CT Amendments - [ Insert ].

**1.2.3** International Fire Safety Code - [ Insert ].

**1.2.4** NFPA 101 - [ Insert ].

**1.3. Connecticut Fire Prevention Code -** [ Insert ].

**1.3.1** NFPA 1 - [ Insert ].

**1.4.** **Occupational Safety and Health Administration (OSHA)**

**1.4.1** OSHA 29 CFR Part 1910 Occupational Safety and Health Regulations - [ Insert ].

**1.4.2** OSHA 29 CFR Part 1926 Occupational Safety and Health Regulations for Construction - [ Insert ].

## 2. For a list of the “latest applicable State Codes” and how they can be obtained see [www.ct.gov/dcs](http://www.ct.gov/dcs) (Connecticut Department of Administrative Services – Division of Construction Services website) and click on “Office of State Building Inspector”. Also visit the [www.ctdol.state.ct.us](http://www.ctdol.state.ct.us) Connecticut Department of Labor website.

## E. Submittals:

NOTE: Retain general requirements in paragraph below. Specific submittals may be specified in other sections.

### **1.** **Permits, Licenses, and Certificates:** For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents.

### **End Section 01 42 19**

### **Reference Standards and Definitions**

## 01 45 00 QUALITY CONTROL

NOTE: This Section 01 45 00 "Quality Control” includes requirements for quality assurance and inspecting and testing laboratory services. It is appropriate for complex single contract work.

Edit paragraphs carefully to reflect specific project requirements, or delete them if they do not apply.

### **A. Related Documents:** All Volumes of the Design-Build Request for Proposals for this Project, including, but not limited to, the D-B Agreement General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## B. Summary

### This Section includes administrative and procedural requirements for quality-control services.

### Quality-Control services include fire alarm acceptance testing, inspections, tests, and related actions, including reports performed by Design-Builder, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the Owner.

### Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Design-Builder of responsibility for compliance with D-B Request for Proposals requirements.

### Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

#### **4.1** Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

#### **4.2** Specified inspections, tests, and related actions do not limit Design-Builder's quality-control procedures that facilitate compliance with D-B Request for Proposals requirements.

#### **4.3** Requirements for Design-Builder to provide quality-control services required by Owner, Construction Administrator, or authorities having jurisdiction are not limited by provisions of this Section.

### **C. Related Sections:** The following Sections contain requirements that relate to this Section:

#### Division 01 **Section 01 33 00 "Submittal Procedures"** specifies requirements for development of a schedule of required tests and inspections.

#### Division 01 **Section 01 73 29 "Cutting and Patching"** specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.

#### Division 01 **Section 01 77 00 "Closeout Procedures**", specific requirements for contract closeout procedures.

#### **D. Responsibilities:**

**NOTE:** Edit test notification hours as appropriate for this in paragraph below. Use only **one** notification time.

### **Design-Builder Responsibilities:** Unless otherwise indicated as the responsibility of another identified entity, the Owner, through the Construction Administrator, shall provide inspections, tests, and other quality-control services specified elsewhere in the D-B Request For Proposal Documents. All such tests are required to be scheduled and notification given to the Construction Administrator **twenty-four (24) / forty-eight (48)** hours in advance of the test/inspection as applicable. Costs for these services are not included in the D-B Contract Sum unless stated otherwise in the D-B Request For Proposal Documents.

#### **1.1** Where individual Design-Builder’s Architect’s Specification Sections or D-B Request For Proposal Documents specifically indicate that certain inspections, tests, and other quality-control services are the Design-Builder’s responsibility, the Design-Builder shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Design-Builder’s D-B Contract Sum.

#### **1.2** Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

##### **1.2.1** Such services include “Special Inspections” as required by the latest edition of the "Connecticut State Building Code".

##### **1.2.2** Where the Owner has engaged a testing agency for testing and inspecting part of the Work, and the Design-Builder is also required to engage an entity for the same or related element, the Design-Builder shall not employ the entity engaged by the Owner. The Owner will engage the services of a qualified Special Inspector for this project. The Special Inspector, as a representative of the Owner, shall document and confirm compliance with the provisions of the Connecticut State Building Code for Special Inspections.

##### **1.2.3** Materials and assemblies for this project will be tested and construction operations inspected as the work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate the State for final acceptance.

##### **1.2.4** The Owner’s use of testing and inspection services shall in no way relieve the Design-Builder of the responsibility to furnish materials and finished construction in full compliance with the Design-Builder’s Contract Documents and the Connecticut State Building Code.

### **2. Retesting:** The Design-Builder is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Design-Builder’s Contract Document requirements, regardless of whether the original test was Design-Builder’s responsibility.

#### **2.1** The cost of retesting construction, revised or replaced by the Design-Builder, is the Design-Builder's responsibility where required tests performed on original construction indicated non-compliance with Design-Builder's Contract Document requirements.

#### **2.2** The Owner will issue a D-B Agreement Amendment to the Design-Builder to compensate the Owner to cover all costs incurred related to all re-tests/re-inspections due to non-compliance to the Design-Builder's Contract Documents, including but not limited to the Owner’s costs and the Construction Administrator’s costs.

### **3.** **Associated Services:** Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the Agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

NOTE: Retain the following paragraph on duties of the testing agency when Design-builder employs the agency.

#### **3.1 Provide access to the Work.**

#### **3.2 Furnish incidental labor and facilities necessary to facilitate inspections and tests.**

#### **3.3 Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.**

#### **3.4 Provide facilities for storage and curing of test samples.**

#### **3.5 Deliver samples to testing laboratories.**

#### **3.6 Provide an approved design mix proposed for use for material mixes that require control by the testing agency.**

#### **3.7 Provide security and protection of samples and test equipment at the Project Site.**

### **4.** **Duties of the Testing Agency:** The independent testing agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Construction Administrator, Design-Builder’s Architect and the Design-Builder in performance of the testing agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

#### **4.1** The testing agency shall notify the Construction Administrator and the Design-Builder promptly of irregularities or deficiencies observed in the Work during performance of its services.

#### **4.2** The testing agency is not authorized to release, revoke, alter, or enlarge requirements of the Design-Builder’s Contract Documents or approve or accept any portion of the Work.

#### **4.3** The testing agency shall not perform any duties of the Design-Builder.

NOTE: List any special requirements regarding testing.

### **5.** Owner will pay for the services of an independent testing agency laboratory to perform inspections, tests and other services required by the D-B Request for Proposal Documents, except as noted below, for which the Owner will issue a D-B Agreement Amendment to the Design-Builder to compensate the Owner to cover the cost associated with these tests:

#### **5.1** When the Design-Builder notifies the Construction Administrator and/or Testing Agency less than **twenty-four 24** hours before the expected time of testing.

#### **5.2** When the Design-Builder requires testing for his own convenience.

#### **5.3** When the Design-Builder schedules a test and is not ready for the required test.

### **6.** Submit reports of tests that are part of the submittal requirements which indicate compliance or non-compliance with the specified standard.

### **7.** See also D-B General Conditions Article 14 "Inspections & Tests".

### **8. Fire Alarm/Acceptance Testing Procedures:**

#### The fire alarm testing shall be as the authority having jurisdiction shall dictate. This will be as determined by the CT DAS / DCS Office State Fire Marshal.

NOTE: Update referenced code section below as applicable.

##### **Protective Signaling Systems:** All protective signaling systems shall meet with acceptance testing requirements of the applicable standards listed in Section 7-6.1.4, NFPA 101/2003 and NFPA 13/2002.

##### **Prior Test Notification:** At least **five (5)** working days prior to testing, the Design-Builder’s Fire Alarm Contractor shall notify (in writing) the following people of the proposed date the acceptance tests are to be performed (Also, see Part 2 of CT DAS / DCS Certificate of Compliance).

##### **.1** CT DAS / DCS Project Manager;

##### **.2** Design-Builder;

##### **.3** Design-Builder’s Engineer of Record;

##### **.4** Design-Builder’s Equipment Supplier Representative;

##### **.5** Design-Builder’s Sprinkler Contractor.

##### **Certificates of Compliance:**

##### **NOTE:** Update referenced code section below as applicable.

###### .1 A Fire Alarm System Inspection and Testing Certification and Description form shall be prepared for each system (See NFPA 72/2002 Chapter 7 and Figure 7-5.2.2).

###### .2 Parts 1 and 3 through 9, shall be completed after the system is installed and the installation of the wiring has been checked. Every alarm device must also be pre-tested to ensure proper operation and correct annunciation at each remote annunciator and control panel. Part 1 of the form (Certification of System Installation) shall be signed by the Design-Builder’s fire alarm contractor. The signed and completed preliminary copies of the Certification form shall be forwarded to all parties along with the Prior Test Notification.

###### .3 Part 2, of each applicable form, shall be completed after the operational tests have been completed.

###### .4 After the completion of the operational acceptance tests and sign-off of test witness (with stipulations noted), final copies of the Certificates shall be forwarded to the CT DAS / DCS Project Manager.

##### **Tests:**

##### **.1** All tests shall be conducted in accordance with the Manufacturer’s Testing Recommendations.

##### **.2** All testing equipment, apparatus (i.e. sound level decibel meter, 2-way radio communication, test devices, ladders, tools, lighting, etc.) and personnel shall be supplied by the Design-Builder’s Fire Alarm Contractor and Sprinkler Contractor

##### **System Documentation:**

##### Every system shall include the following documentation, which shall be delivered to the CT DAS / DCS Project Manager through the Construction Administrator upon final acceptance of the system. An owner's manual or manufacturer's installation instructions covering all system equipment, including the following:

**.1** A detailed narrative description of the system inputs, evacuation signaling, ancillary functions, annunciation, intended sequence of operations, expansion capability, application considerations, and limitations.

**.2** Operator’s instructions for basic systems operations including alarm acknowledgment, system reset, interpreting system output (LED's CRT display, and printout), operation of manual evacuation signaling and ancillary function controls, changing printer paper, etc.

**.3** A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract, including testing and maintenance instructions for each type of device installed. This information should include:

**.1** A listing of individual system components that require periodic testing and maintenance.

**.2** Step by step instructions detailing the requisite testing and maintenance procedures and the intervals at which those procedures should be performed.

**.3** A schedule that correlates the testing and maintenance procedures required by paragraph (2) above and with the listing required by paragraph (1) above.

**.4** Detailed troubleshooting instructions for each type of trouble condition recognized by the system, including opens, grounds, parity errors, "loop failures," etc. These instructions should include a list of all trouble signals, and step by step instructions describing how to isolate those problems and correct them (or call for service as appropriate).

##### **.5** A service directory, including a list of names and telephone numbers for those who should be called to service the system.

##### **As-Built Drawings:**

##### **.1** The Design-Builder will produce **two (2)** sets of as-built drawings and specifications for the fire alarm system, indicating the location (and programmed address, if applicable) of all devices and appliances, the wiring sequences, wiring methods, connection of the components, and sequence of operation of the protective signaling system as installed, shall be given to the CT DAS / DCS Project Manager through the Construction Administrator. This shall be in Accordance with NFPA 72. Refer also to **Section 01 77 00 "Closeout Procedures".**

## E. Submittals

### **1.** Unless the Design-Builder is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Construction Administrator.

#### **1.1** Submit additional copies of each written report directly to the Authority Having Jurisdiction, when the Authority so directs.

#### **1.2** **Report Data:** Written reports of each inspection, test, or similar service include, but are not limited to, the following:

##### **1.2.1** Date of issue.

##### **1.2.2** Project title and number.

##### **1.2.3** Name, address, and telephone number of testing agency.

##### **1.2.4** Dates and locations of samples and tests or inspections.

##### **1.2.5** Names of individuals making the inspection or test.

##### **1.2.6** Designation of the Work and test method.

##### **.1** Identification of product and Specification Section.

##### **.2** Complete inspection or test data.

##### **.3** Test results and an interpretation of test results.

##### **.4** Ambient conditions at the time of sample taking and testing.

##### **.5** Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.

##### **.6** Name and signature of laboratory inspector.

##### **.7** Recommendations on re-testing.

## F. Quality Assurance

### **1.** **Qualifications for Service Agencies:** Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with the National Voluntary Laboratory Accreditation Program and that specialize in the types of inspections and tests to be performed.

#### **1.1** Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

### **2.** **Mockups:** Provide full-size, physical assemblies that are constructed on-site. Mockups will be used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not samples. Approved mockups establish the standard by which the Work will be judged.

## G. Repair and Protection

### **General:** Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Design-Builder’s Contract Document requirements for Division 01 **Section 01 73 29 "Cutting and Patching."**

### Protect construction exposed by or for quality-control service activities, and protect repaired construction.

### **2.** Repair and protection is Design-Builder’s responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

### **End Section 01 45 00**

### **Quality Control**

## 01 45 23 TESTING FOR INDOOR AIR QUALITY, BASELINE IAQ, & MATERIALS

**NOTE:** If the specific project **does not require** LEED Certification and Commissioning then **delete** this Section from this document.

##### **NOTE:** This Section 01 45 23 "Testing For Indoor Air Quality, Baseline IAQ, & Materials” includes requirements for baseline Indoor Air Quality (IAQ) testing for maximum indoor pollutant concentrations for acceptance of the facility.

##### **NOTE:** Revise paragraphs carefully to reflect specific project requirements, or delete them if they do not apply.

## A. Related Documents: All Volumes of the Design-Build Request for Proposals for this Project, including, but not limited to, the D-B Agreement General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## B. Summary:

#### **1.** This Section includes the following:

##### **1.1** Requirements of baseline Indoor Air Quality (IAQ) testing for maximum indoor pollutant concentrations for acceptance of the facility.

##### **1.2** Requirements for independent materials testing of specific materials anticipated to have major impact on IAQ.

##### **1.3** Procedures for testing specific construction materials for IAQ performance to assure compliance with LEED rating system credits. Materials have been identified for independent testing based on the following **three (3)** criteria:

###### 1.3.1 Large volume of material used in occupied spaces.

###### 1.3.2 The space is occupied during normal working hours.

###### 1.3.3 Materials are used in an area where there is recirculating air.

#### **2.** **Related Sections:** The following Sections shall contain requirements that relate to this Section:

##### **2.1** **Divisions 01 through 49** of the Design-Builders sections for LEED rating system requirements specific to the Work of each of those sections. These requirements may or may not include reference to LEED.

##### **2.2** **Division 23** **Section** **23 05 93 "Testing, Adjusting and Balancing for HVAC"** of the Design-Builders for additional requirements for baseline testing for IAQ.

##### **2.3** **Division 23 Section 23 05 93 "Testing, Adjusting and Balancing for HVAC"** of the Design-Builders for cleaning of HVAC system including duct work, air intakes and returns, and changing of filters.

## C. References:

##### **NOTE:** Update referenced Standards below as applicable.

#### **1.** **American Society of Heating, Refrigerating and Air Conditioning Engineers** (ASHRAE):

##### **1.1** ASHRAE 52.2-1999, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

#### **2.** **ASTM International, Inc.** (ASTM):

##### **2.1** ASTM D5116-2006, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

#### **3.** **Sheet Metal and Air Conditioning Contractors’ National Association** (SMACNA):

##### **3.1** IAQ Guidelines for Occupied Buildings Under Construction, 1995.

#### **4.** **United States Environmental Protection Agency (**EPA):

##### **4.1** Compendium of Methods for the Determination of Air Pollutants in Indoor Air.

## D. Submittals:

#### **1.** **Baseline IAQ Testing:** Submit a report for each test site specified for IAQ baseline testing as prescribed in the Design-Builder’s **Section 23 05 93 "Testing, Adjusting and Balancing for HVAC".** Report on air concentrations of targeted pollutants as identified in **Table 3.1** **–“Maximum Indoor Air Concentration Standards”** below.

#### **2.** **Product Emissions Test Reports:** Submit a report for each material emissions test performed. Report test results in terms of emission factors that will be used by the Owner to model indoor air concentrations. These reports and the modeling data prepared by the Owner shall be included in the closeout documentation specified in **Section** **01 77 00 "Closeout Procedures".**

#### **3. LEED Certification Documentation Submittals:**

##### **3.1 Construction Indoor Air Quality (IAQ) Management Plan (During Construction) Credit:**

###### .1 Construction IAQ management plan.

###### .2 Letter confirming if the permanently installed air handling equipment was used during construction.

###### .3 Product data for temporary filtration media. Indicate manufacturer, model number, MERV rating, and location of installed media.

###### .4 Letter confirming that each filtration media was replaced prior to final occupancy.

###### .5 Product data for filtration media to be used during occupancy. Indicate manufacturer, model number, MERV rating, and location of media.

###### .6 Construction Documentation: *Six (6)* photographs at *three (3)* different occasions during construction along with a brief description of the SMACNA approach employed, document implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.

##### **3.2** **Construction Indoor Air Quality (IAQ) Management Plan (Before Occupancy) Credit:**

###### .1 Signed letter confirming the approach taken by the project (pre-occupancy flush-out; flush-out with early occupancy flush-out or IAQ testing).

###### .2 A narrative describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.

###### .3 Product data for filtration media used during flush-out and during occupancy.

###### .4 A narrative describing the building’s IAQ testing process and results including the dates when testing was started and completed.

###### .5 Report from testing and inspecting agency indicating results of IAQ testing and documentation showing conformance with IAQ testing procedures and requirements.

## E. Quality Assurance;

#### **1.** Perform material tests and report results in accordance with ASTM D5116.

## F. Baseline lAQ Testing:

#### **1.** **HVAC System Verification:** To assure compliance with recognized standards for indoor air quality including ASHRAE 62-2004, the Owner’s independent testing and balancing agency shall verify the performance of each HVAC system including space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources.

#### **2.** **Indoor Air Quality Testing:** Upon verification of HVAC system operation, the Design-Builder shall hire an independent contractor, subject to approval by the Construction Administrator, with a minimum of **five (5)** years experience in performing the types of testing specified herein, to test levels of indoor air contaminants for compliance with specified requirements.

##### **2.1** Submit a test plan for the approval of the Construction Administrator. The plan shall specify procedures, times, instrumentation, and sampling methods that will be employed.

##### **2.2** Perform testing in **sixteen [16] [\_*Insert*\_]** different locations. Contaminant levels are to be measured on **[each floor of each building in an area]** **[\_*Insert*\_]** agreed upon by the Design-Builder and the Construction Administrator. Areas with very high outside air ventilation rates such as laboratories are excluded from these testing requirements. The Construction Administrator is the sole judge of areas exempt from testing.

##### **2.3** Collect air samples on **three (3) consecutive** Calendar Days during normal business hours (between the hours of 8:00 AM and 5:00 PM) with building operating at normal HVAC rates. Average the results of each three-day test cycle to determine compliance or non-compliance of indoor air quality for each air handling zone tested.

##### **2.4** Sample and record outside air levels of formaldehyde and TVOC contaminants at outside air intake of each respective air handling unit simultaneously with indoor tests to establish basis of comparison for these contaminant levels. Indoor testing will be done in the breathing zone; between **four (4)** and **seven (7)** feet from the floor.

##### **2.5** Acceptance of respective portions of **[the building] [buildings]** by the Architect is subject to compliance with specified limits of indoor air quality contaminant levels.

#### **3.** Compliance indoor air quality shall conform to the following standards and limits:

##### **3.1** **Carbon Monoxide:** Not to exceed nine (9) ppm.

##### **3.2** **Carbon Dioxide:** Not to exceed 800 ppm.

##### **3.3** **Airborne Mold and Mildew:** Simultaneous indoor and outdoor readings.

##### **3.4 Maximum Air Concentration Standards:** Indoor room air concentration levels, emission rates, and qualities of the listed contaminants shall not exceed the following limits specified in **Table 5.1** **Maximum Indoor Air Concentration Standards** below.

#### **4.** **Test Reports:** Prepare test reports showing the results and location of each test, a summary of the HVAC operating conditions, a listing of any discrepancies and recommendations for corrective actions, if required.

##### **4.1** Include certification of test equipment calibration with each test report.

#### **5.** If any test fails the standard, the Design-Builder is responsible to ventilate the building with one **hundred percent (100%)** outside air until the building passes both air quality tests and duct inspections. Retesting shall be performed at no additional expense to the Owner.

**Table 5.1 Maximum Indoor Air Concentration Standards**

|  |  |
| --- | --- |
| **Indoor Contaminants** | **Maximum Air**  **Concentration Levels\*** |
| Formaldehyde | 50 parts per billion |
| Particulates (PM10) | 50 micrograms per cubic meter |
| Total Volatile Organic Compounds (TVOC) | 500 micrograms per cubic meter |
| 4-Phenylcyclohexene (4-PCH)\*\* | 6.5 micrograms per cubic meter |
| Carbon Monoxide (CO) | 9 parts per million and no greater than 2 parts per million above outdoor levels |

\* All levels must be achieved prior to acceptance of the building. The levels do not account for contributions from office furniture, occupants, and occupant activities.

\*\* This test is only required if carpet and fabrics with styrene-butadiene rubber (SBR) latex backing material are installed in the building.

#### **6.** **Construction Indoor Air Quality (IAQ) Management Plan (During Construction) Credit:** Comply with SMACNA IAQ Guidelines for Occupied Buildings under Construction.

#### **7.** **Construction Indoor Air Quality (IAQ) Management Plan (Before Construction) Credit:**

##### **7.1** After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14000 cu ft of outdoor air per sq ft of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60 percent.

##### **7.2** If building occupancy is to occur before completion of the flush-out, deliver a minimum of 3500 cu ft of outdoor air per sq ft of floor area to the space. Once the space is occupied, ventilate it at a minimum rate of 0.30 cfm/sq ft of outside air or the design minimum outside air rate determined in accordance with Sections 4 through 7 of ASHRAE 62.1 or applicable local code, whichever is more stringent. During each day of the flush-out period, begin ventilation a minimum of **three (3) hours** prior to occupancy and continue during occupancy. Maintain these conditions until a total of 14000 cu ft/sq ft of outside air has been delivered to the space.

##### **NOTE:** Update referenced Standard below as applicable.

##### **7.3** Engage an independent testing and inspecting agency to conduct a baseline IAQ testing program according to EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air and the U.S. Green Building Council (USGBC) **LEED for New Construction Version 3.0** Reference Guide.

## G. Independent Materials Testing:

#### **1.** **Materials That Must Be Tested:** Test materials listed below that are proposed for use on this project for permanent, in-place Indoor Air Quality performance in accordance with requirements of these specifications. Results shall be furnished to the Architect. Materials meeting the criteria for independent testing are as follows:

##### **1.1** Field applied paint systems on appropriate substrate. Paint primers and intermediate coats (if used) should be applied with a typical drying time allowed between coats (not to exceed **seven (7)** Calendar Days).

##### **1.2** Carpet including manufacturer’s recommended adhesive. The carpet will be applied to the appropriate concrete flooring per manufacturer's instructions so that the testing is of the "carpet assembly."

##### **1.3** Acoustical ceiling tile.

##### **1.4** Fireproofing material applied to appropriate substrate.

#### **2.** **Materials for Testing:** Only test representative samples of actual products selected for use on this project. Tests of products generically and/or technically similar but produced by a manufacturer other than that of the product selected for use on this project is invalid.

#### **3.** **Materials Testing Parameters:**

##### **3.1** Wrap each material to be tested in air tight covering for shipment direct from the factory to the testing laboratory to avoid contamination in transit. Unwrap material or apply material to substrate if material is wet-applied, such as paint or adhesive materials) in the testing lab.

##### **3.2** Emissions Testing: Perform all testing in accordance with ASTM D5116. Report results in accordance with Section ii of referenced ASTM Standard. Report in terms of emission rates at a minimum of **three (3)** distinct time intervals (e.g., **one (1) hour, 24 hours, 72 hours)** that will be modeled by the Design-Builder’s Architect to predict maximum indoor air concentrations and to assist the Design-Builder in determining suitability of products or materials. Assumptions that will be used for the Design-Builder’s Architect model are given below for information.

##### **4.** **Table 4.2** summarizes required product testing.

**Table 4.2 PRODUCT EMISSION TESTING**

|  |  |  |
| --- | --- | --- |
| **PRODUCT ASSEMBLY TO BE TESTED** | **TVOC**  **(per ASTM)** | **PM**  **(per NIOSH)** |
| Wall paint on appropriate substrate, including any primer coat | Yes | No |
| Carpet including adhesive and concrete flooring | Yes | No |
| Acoustical Ceiling Tile | No | Yes |
| Fireproofing material on appropriate substrate | No | Yes |

#### **5.** **Model Assumptions Used for Predicting Indoor Air Concentrations:** The model will assume the standard room enclosure as 10' long x 10' wide x 9' high. Each product tested will be modeled separately to provide information on the particular product. The model will assume a ventilation rate of one (1) air change per hour.

##### **5.1** **Field Applied Paint Systems:** Test fully cured samples of each complete paint system including primers, intermediate coats (if used), and finish coats. The model assumes application to all four (4) walls and one-half of ceiling of model standard room enclosure.

##### **5.2** **Carpet and Adhesive Assembly:** Assumes application to entire 10 x 10 ft floor surface of model standard room enclosure.

##### **5.3** **Acoustical Ceiling Tile:** Assumes application to entire 10 x 10 ft ceiling surface of model standard room enclosure.

##### **5.4 Fireproofing:** Assumes application to entire 10 x 10 ft area above the ceiling surface of model standard room enclosure.

#### **6.** **Materials Test Reports:** Submit test reports to the Construction Administrator. The report shall include the information outlined in Section 11 of ASTM D5116.

#### **H.** **Product/Material Evaluation:** All products/materials shown by testing to comply with emissions limits and other criteria specified in this section will be approved for use on this project subject to compliance with all other specified requirements of the Design-Builder’s Project Manual. Products/materials shown by model to exceed specified emission limits shall be discussed, test results interpreted, and a determination made as to alternative product uses or selections.

**End Section 01 45 23**

**Testing For Indoor Air Quality, Baseline IAQ, & Materials**

**END SECTION 01 40 00**

**QUALITY REQUIREMENTS**