**NOTES TO ARCHITECT/ENGINEER (A/E) & DAS/CS PROJECT MANAGER:**

This version of the Division 01 General Requirements is for **ALL** CT Department of Administrative Services (DAS) Construction Services (CS) **Design-Bid-Build (DBB) AND Construction Manager at Risk (CMR) Capital Construction Projects.**

IMPORTANT NOTE: Section 01 45 23.13 Testing For Indoor Air Quality (IAQ), Baseline IAQ, & Materials includes IAQ testing for maximum indoor pollutant concentrations for acceptance of the facility & requirements for independent materials testing of specific materials anticipated to have major impact on IAQ.. Coordinate with requirements of other sections; verify that products and installation methods specified in other sections are environmentally appropriate. Edit to suit location and 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.

**TEXT:** The below **blue text** are project specific information that must be completed by the A/E 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 A/E 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: The header** 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 shown herein. The header of each page shall contain the Section Number, the Section Title, and the page number & number of pages as shown herein.

**FOOTERS: The 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 footer shown herein. The footer shall contain the project number in the right hand side as shown herein. The revision date in the left side of the footer is to remain as it is for Department informational purposes only and should not be altered by the Architect/Engineer.

**SECTIONS AND PARAGRAPHS:** If a **Section** is not part of the project scope, **do not use** the Section in the General Requirements. Check “**NOT USED**” in the Table of Contents. **DO NOT delete** the Section title from the Table of Contents.

If a **Paragraph** is not applicable to the project, **delete the contents** of the Paragraph and renumber the subsequent Paragraphs. Edit **Paragraphs** carefully to reflect specific project requirements. DO NOT include Paragraphs or parts of Paragraphs in the project manual, which have no applicability to the specific project. KEEP IN NUMERICAL SEQUENCE and re-number as necessary.

**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 A/E. Division 01 must be closely coordinated with Division 00, Divisions 02 through 49, Division 50 (Project-Specific Available Information), the Drawings, and the Department’s Consultant Bid Data Statement (Form 6005, to be filled out by the A/E for bidding).

**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.**

PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

#### **A.** Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

## 1.2 SUMMARY

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

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

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

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

###### **a.** Large volume of material used in occupied spaces.

###### **b.** The space is occupied during normal working hours.

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

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

##### **1.** Divisions 01 through 49 sections for green building rating system requirements specific to the Work of each of those sections. These requirements may or may not include reference to LEED or Green Globes.

##### **2.** Division 23 Section 23 05 93 "Testing, Adjusting and Balancing for HVAC" for additional requirements for baseline testing for IAQ.

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

## 1.3 REFERENCES

NOTE: AMEND DATES OF THE BELOW regulations based upon the either the date of the certificate of compliance for all Non-Threshold projects or the permit application date for all Threshold projects.

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

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

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

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

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

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

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

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

## 1.4 SUBMITTALS

#### **A. Baseline IAQ Testing:** Submit a report for each test site specified for IAQ baseline testing as prescribed in Section 23 05 93 "Testing, Adjusting and Balancing for HVAC". Report on air concentrations of targeted pollutants as identified in Table 3.1 below.

#### **B. 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".

#### **C. Green Building Certification Documentation Submittals:**

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

###### **a.** Construction IAQ management plan.

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

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

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

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

###### **f.** 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.

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

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

###### **b.** 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.

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

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

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

## 1.5 QUALITY ASSURANCE

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

## 3.1 BASELINE lAQ TESTING

#### **A. HVAC System Verification:** To assure compliance with recognized standards for indoor air quality including ASHRAE 62-2004, the [Contractor's] [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.

#### **B. Indoor Air Quality Testing:** Upon verification of HVAC system operation, the Contractor shall hire an independent contractor, subject to approval by the Architect, 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.

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

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

##### **3.** Collect air samples on **three (3) consecutive** 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.

##### **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.

##### **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.

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

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

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

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

##### **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 3.1 below.

#### **D. 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.

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

#### **E.** If any test fails the standard, the Contractor is responsible to ventilate the building with 100 percent 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 3.1 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.

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

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

##### **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.

###### **a.** [**Insert reference to specification section where building air flush-out is specified in detail or insert requirements here.**]

##### **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.

##### **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 LEED for New Construction Version 2.2 Reference Guide].

## 3.2 INDEPENDENT MATERIALS TESTING

#### **A. 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.** 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) days).

##### **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."

##### **3.** Acoustical ceiling tile.

##### 4. Fireproofing material applied to appropriate substrate.

#### **B. 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.

#### **C. Materials Testing Parameters:**

##### **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.

##### **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 Architect to predict maximum indoor air concentrations and to assist the Contractor in determining suitability of products or materials. Assumptions that will be used for the Architect’s model are given below for information.

##### **3.** Table 3.2 summarizes required product testing.

**Table 3.2 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 |

#### **D. 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.

##### **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.

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

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

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

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

#### **F. 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 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 OF SECTION 01 45 23.13