SECTION 01 5719 - INDOOR AIR QUALITY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.
B. Testing indoor air quality before commencement of construction; existing building areas only.
C. Testing indoor air quality after completion of construction.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
   3. Establish condition of existing ducts and equipment prior to start of alterations.
B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size 2017, with Addendum a.
B. ASHRAE Std 129 - Measuring Air-Change Effectiveness. 1997 (Reaffirmed 2002).
C. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization 2019.
D. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction 2007.

1.04 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
C. Particulates: Dust, dirt, and other airborne solid matter.
D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
   1. Submit not less than 60 days before enclosure of building.
   2. Identify potential sources of odor and dust.
   3. Identify construction activities likely to produce odor or dust.
   4. Identify areas of project potentially affected, especially occupied areas.
   5. Evaluate potential problems by severity and describe methods of control.
   6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
   7. Describe cleaning and dust control procedures.
   8. Describe coordination with commissioning procedures.
C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.
E. Indoor Air Quality Testing Plan: Identify:
   1. Testing agency qualifications.
   2. Locations and scheduling of air sampling.
   3. Test procedures, in detail.
   4. Test instruments and apparatus.
   5. Sampling methods.
F. Indoor Air Quality Testing Reports: Show:
   1. Location where each sample was taken, and time.
   2. Test values for each air sample.
   3. HVAC operating conditions.
   4. Certification of test equipment calibration.
   5. Other conditions or discrepancies that might have influenced results.
   6. Interpretation of test results.
   7. Recommendations for improvement of indoor air quality or retesting.

1.06 **QUALITY ASSURANCE**

A. Firm Qualifications: The indoor air quality testing firm must have a minimum of five years experience specifically in the indoor environmental quality field and must have indoor environmental testing and consulting capabilities. Firm should be a licensed mold assessment company (ACO) through the Texas Department of State Health Services, and should have a minimum of three mold assessment consultants (MACs) on staff. Additionally, the firm's consultants should maintain current certification in indoor environmental consulting (i.e. Certified Indoor Environmental Consultant (CIEC) through the American Council for Accredited Certification (ACAC) or other certifying association. The firm should employ a LEED-Accredited Professional, certified by the United States Green Building Council (USGBC).
B. Laboratory Qualifications: The microbiology testing laboratory utilized by the consulting firm should have a minimum of five years experience, be a licensed mold analysis laboratory through the Texas Department of State Health Services, and should employ a degreed mycologist. The industrial hygiene laboratory utilized by the consulting firm should have a minimum of five years experience, and be accredited by the American Industrial Hygiene Association (AIHA).

PART 2 PRODUCTS

2.01 **MATERIALS**

A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE Std 52.2.

PART 3 EXECUTION

3.01 **CONSTRUCTION PROCEDURES**

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
   1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
   2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
   3. Provide sufficient ventilation for drying within reasonable time frame.
B. Begin construction ventilation when building is substantially enclosed.
C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.
D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area. Provide pre-construction air filters to all return air registers in adjacent occupied areas.

E. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:
   1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
   2. Exhaust directly to outside.
   3. Seal HVAC air inlets and outlets immediately after duct installation.
F. Do not store construction materials or waste in mechanical or electrical rooms.
G. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
   1. Inspect duct intakes, return air grilles, and terminal units for dust.
   2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
   3. Clean tops of doors and frames.
   4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
   5. Clean return plenums of air handling units.
   6. Remove intake filters last, after cleaning is complete.
H. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
I. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 **INDOOR AIR QUALITY TESTING (IAQ)**

A. On-site Observations
   1. A minimum of three visits and up to six site visits will be made to the site to conduct on-site observations during the construction phase relative to water intrusion issues or other building conditions that might cause future degradation to indoor air quality. These observations may include but are not limited to landscape grade and drainage, foundation height, exterior wall sealing, roof and wall enclosure penetrations, water or moisture intrusion, plumbing, storage and condition of absorbent building materials, sealing and hygiene of HVAC systems, control of particulates, etc.
   2. This phase may also include a review of specifications for building products such as paint, adhesives, carpet, and cabinetry for products that might degrade future indoor air quality when installed.
   3. A written report will be submitted to the Architect or Owner's representative after each on-site observation. The report will include project conditions on the day of inspection along with cited potential problems areas and photo-documentation as needed.
      a. Critical Condition Report: If a condition is cited that may cause potential microbial contamination in area that is ready to be sealed or covered, a verbal report will be communicated to the Architect or Owner's representative within twenty-four (24) hours so the Contractor can have the condition corrected before work is continued
      b. Standard Report: A written report will be submitted to the Architect or Owner's representative within ten (10) working days of the site visit.
B. Pre-Construction Inspection and Sampling: Perform indoor air quality testing before starting construction, as base line for evaluation of post-construction testing.
   1. If the construction project is an addition to an existing facility, pre-construction inspection and sampling will be conducted to determine baseline conditions within the existing facility.
   2. The testing conducted in item C-2 of the pre-occupancy testing below will be conducted in areas of the existing facility that will be adjoining the new construction.
   3. During construction activities on-site observations will include any impact to the indoor air quality of the existing facility.
C. Pre-Occupancy Inspection and Sampling: Perform indoor air quality testing before occupancy.

1. After substantial completion of the facility and before non-fixed furnishings are delivered, the firm will conduct an IAQ inspection and perform representative sampling for indoor air quality parameters. These measurements will establish background pre-occupancy conditions, and will be evaluated for acceptable levels. All samples collected will be area screening samples to determine the presence of the parameters of interest. If the screening results indicate significant positive results, additional investigation may be required.
2. The air quality sampling includes the collection of samples for the determination of populations and concentrations of total fungal bioaerosols in the ambient air. The sampling also includes the collection of chemical samples for fixed gas analysis for total volatile organic compounds (TVOCs), methane, carbon dioxide, and carbon monoxide. Additional real-time monitoring will be conducted for the following parameters: temperature, relative humidity, carbon dioxide, carbon monoxide, radon, ozone, and large (>10 microns) and small particulates (2.5 to 10 microns).
3. Testing in a school facility will include the collection of samples in representative areas of the classroom wings (to include a minimum of 20% of the classrooms), and if part of the new construction, in the cafeteria, library, administration offices, gymnasium, and locker rooms. Additionally, two outdoor samples will be collected on each day of testing for comparison purposes.
4. If significant areas of rubber-backed carpeting and/or composite fixed furnishings are present in the facility, testing will also be conducted in representative areas for 4-phenylcyclohexene and formaldehyde in the ambient air. This testing will not be conducted if carpeting and fixed furnishings have been installed which are certified to be free of these chemicals.
5. If foundation treatment for termite control has been applied, testing of the ambient air for the applied pesticide will be conducted in a minimum of three representative first floor locations of the facility.
6. Testing for lead-based paint and asbestos-containing materials will not be conducted unless there is an indication that lead-based paint and/or asbestos-containing materials may be present in the existing structure, and that it may be impacted by the new construction activities.
7. A report of findings and any recommendations will be provided within fifteen (15) working days of the sampling event.

D. Do not start pre-occupancy indoor air quality testing until:
   1. All construction is complete, including interior finishes.
   2. HVAC systems have been tested, adjusted, and balanced for proper operation.
   3. Cleaning of inside of HVAC ductwork, if specified elsewhere, has been completed.
   4. New HVAC filtration media have been installed.

E. Post-Occupancy Inspection and Sampling:
   1. At five (5) months and eleven (11) months following substantial completion, but prior to the one (1) year project inspection, the testing conducted in item C-2 of the pre-occupancy testing above will be repeated.
   2. A report of findings and any recommendations will be provided within fifteen (15) working days of the sampling event.

F. Indoor Air Quality Acceptance Criteria
   1. Upon completion of the project, the indoor air quality testing firm will provide a report of findings to the Architect or Owner’s representative indicating any IAQ parameters that do not meet the acceptance criteria.
   2. The following criteria will be used to determine acceptance:

a. Fungal Bioaerosols - measure in relation to outdoor air, generally not higher than outdoor air, and containing indoor populations and concentrations of fungi that are considered normal and typical. Use professional judgment of testing firm.
b. Carbon Monoxide - measure in ppm, in relation to outdoor air. Not more than 2 ppm over outdoor air levels, and less than 9 ppm.
c. Carbon Dioxide - measure in ppm, in relation to outdoor air. Not more than 700 ppm higher than outdoor air.
d. Methane - measure in ppm. Not more than 5 ppm.
e. Total Volatile Organic Compounds (TVOCs) - measure in ppm as methane, or milligrams per cubic meter (mg/m3) - not more than outdoor air, and less than 5 ppm (calculated as methane) or 3 mg/m3.
f. Total Particulates - measure in total particle counts - total particle counts generally less than one-half (1/2) of outdoor air. Particle counts broken down to small (2.5 to 10 microns) and large (>10 microns).
g. Radon - less than 2 picoCuries per liter (pCi/L).
h. Ozone - nor more than outdoor air, and less than 0.1 ppm.
i. Formaldehyde - measure in parts per billion (ppb) - less than 50 ppb.
j. 4-Phenylcyclohexene - measure in micrograms per cubic meter (µg/m3) - not more than 3 µg/m3.
k. Pesticides - note presence and level of specific pesticide applied.
l. Lead - have paint supplier or contractor provide documentation of lead-free paint.

G. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner,.

END OF SECTION