

SECTION 018119
INDOOR AIR QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 SUMMARY

- A. The Work of this Section includes, but is not limited to, requirements for the following procedures:
 - 1. General procedures for maintaining indoor air quality.
 - 2. Selection of products.
 - 3. Mixing of two-component products.
 - 4. Work procedures.
 - 5. Flushout procedures.
 - 6. Integrated pest management.
- B. Related work includes, but is not limited to, the following work under other Sections:
 - 1. Scheduling requirements for building flush-out: Section 013200 – Construction Progress Documentation
 - 2. Separate line item for IAQ Control measures in Schedule of Values: Section 012400 – Schedule of Values.
 - 3. Submittal procedures: Section 013300 – Submittal Procedures.
 - 4. Weatherproof enclosures and cleaning materials: Section 015000 - Temporary Facilities and Controls.
 - 5. Sustainable design requirements: Section 018113 – Sustainable Design Requirements.
 - 6. Sealing of air intakes during roofing installation: Section 075400 – Thermoplastic Membrane Roofing.
 - 7. Temporary and permanent filters and other provisions for air handling systems: Division 23 – MECHANICAL.

1.3 INTENT

- A. It is the intent of the Owner to maintain a healthful environment for the present and future occupants of the building. Therefore, the Contractor shall conduct the Work in such a way as to avoid creating indoor air quality problems. Required procedures include:
 - 1. Limiting use of products that may contribute to poor indoor air quality.

2. Maintaining work procedures which contain and alleviate dusts and odors and air-borne contaminants.
 3. Protection of materials from moisture.
- B. The Contractor's attention is directed to the provisions throughout the Contract Documents intended to maintain indoor air quality during construction and after completion of the Project. These provisions will be strictly enforced. The Contractor and Filed Sub-Bid Contractors shall notify and require each subcontractor, sub-subcontractor and materials vendor to comply with such provisions.
- C. Pest Control Impact on IAQ: With the intent of eliminating or minimizing the use of chemical pesticides, which can become airborne contaminants, the Contractor shall implement an Integrated Pest Management Plan (IPM), consistent with the requirements of the Massachusetts Legislature, Chapter 85 of the Acts of 2000, "An Act Protecting Children and Families from Harmful Pesticides", and IPM Guidelines issued by the Massachusetts Department of Food and Agriculture Pesticide Bureau.
1. Key aspects of pest control for this Project include:
 - a. Construction areas shall be kept clean to minimize residue that will serve as nutrients or harborage for insects and rodents.
 - b. No discarded food shall remain on the construction site overnight.
 - c. Application of chemical pesticides shall be considered a last resort after other methods have failed, and shall be performed by licensed pest control professionals.
 - d. Control of insects shall be performed using traps containing baits and gels.
 - e. Control of rodents shall be performed using mechanical traps.
 - f. Plant growth will be controlled by hand weeding wherever practical and the use of herbicides will be strictly limited, in accordance with the requirements of landscape Sections.
 2. The Contractor shall develop and implement IPM goals and procedures with respect to the control of pests during construction.
 3. Refer to specific technical Sections for pest control products and procedures to be incorporated into the Work in compliance with the Owner's IPM.

1.4 DEFINITIONS

- A. "IAQ": Indoor Air Quality.
- B. "MSDS": Material Safety Data Sheet.
- C. "REL": Reference Established Limit, a highest permissible concentration of a given airborne compound.
- D. "VOC": Volatile Organic Compound.
- E. "Work Area": The portions of the building or site given over to the Contractor for the construction of new Work required by the Contract Documents.

1.5 REFERENCE STANDARDS

- A. This Project has been designed to meet the following requirements and regulations. Where dif-

INDOOR AIR QUALITY REQUIREMENTS

018119 - 2

SITE PLAN REVIEW APPLICATION- PROPOSED SPECIFICATION LANGUAGE

ferent criteria for a given component of the Work are not in agreement, the Contractor shall be required to meet the most restrictive criterion, unless otherwise indicated in the Contract Documents.

1. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE), 1999: ASHRAE Standard 62-1999, Ventilation for acceptable Indoor Air Quality.
2. American Society for the Testing and Materials (ASTM):
 - a. ASTM D5116-97, Guide for Small Scale Environmental Chamber Determination of Organic Emissions from Indoor Materials/Products.
3. The Commonwealth of Massachusetts, Department of Labor and Workforce Development, Division of Occupational Safety, Occupational Hygiene Program, 1997: "Preventing Indoor Air Quality Problems During Construction and Renovation."
4. The Commonwealth of Massachusetts, Regulations: Table 310 CMR 7.25.
5. Occupational and Safety and Health Administration (OSHA): Relevant standards on indoor air quality, including the following:
 - a. 29 CFR 1926.59, Hazard Communication
 - b. 29 CFR 1910.95, Occupational Noise Exposure
 - c. 29 CFR 1910.146, Permit Required Confined Spaces
 - d. 29 CFR 1910.1000, Air Contaminants
 - e. 29 CFR 1910.1200, Hazard Communication.
6. Sheet Metal and Air Conditioning National Association (SMACNA): "IAQ Guidelines for Occupied Buildings under Construction" and "Duct Cleanliness for New Construction Guidelines."
7. United States Green Building Council, LEED Reference Guide, CURRENT edition.
8. Collaborative for High Performance Schools; Massachusetts High Performance Schools Guidelines: Criteria; Version 1.0, dated October 16, 2006.

1.6 PERFORMANCE REQUIREMENTS

- A. VOC Emissions: Products have been selected for this Project with respect to their emissions of Volatile Organic Compounds, in order to limit concentrations of VOC's in occupied spaces to levels below the Reference Established Limits established by the State of California.
 1. Maximum allowable concentrations of VOC's include the following:
 - a. Total VOC's (TVOC):
 - b. Formaldehyde: $3 \mu\text{g}/\text{m}^3$
 - c. Naphthalene: $9 \mu\text{g}/\text{m}^3$
 - d. Styrene: $300 \mu\text{g}/\text{m}^3$
 - e. Isocyanurates:
 - f. Diesel Exhaust: $5 \mu\text{g}/\text{m}^3$
 2. Substitutions for any specified VOC-containing product specified will be considered with the condition that acceptable VOC-emission data are available for the proposed product, or the Contractor arranges to have that product tested for VOC emissions by an independent laboratory.
- B. Airborne Dust: Dust partitions, site dust control measures and other construction practices shall be maintained to prevent airborne dust from leaving the site or accumulating in the building interior.
- C. Moisture: Weather protection, scheduling of the Work, restoration drying techniques using desiccant drying, dehumidification and other construction practices shall be used to maintain the schedule and to prevent construction materials from reaching moisture levels that will support the

INDOOR AIR QUALITY REQUIREMENTS

018119 - 3

growth of mold, bacteria and other biological contaminants.

1. Maximum Equivalent Moisture Content (EMC) of substrates installed wet or wetted during the construction process such as concrete, and concrete block shall be measured before application of mold-sensitive finishes. Installation of the following products shall not proceed until the relative humidity in the substrate does not exceed 70 percent relative Humidity (RH) as measured using ASTM F 2170, or in accordance with the manufacturer's written limitations, whichever is lower:
 - a. Non-preserved-treated wood products
 - b. Gypsum wallboard
 - c. Carpet
 - d. Acoustical ceiling tile
 - e. Fabric-covered acoustical panels and tackboards
 - f. Fixed upholstered seating
2. Wood-based finish products such as flooring, architectural woodwork, casework etc. shall additionally follow the environmental temperature and RH criteria limits established within their respective sections.

1.7 SUBMITTALS

- A. General: Prepare submittals for the Work of this Section according to the procedures outlined in Section 01300 – Submittals, modified as required herein. These submittals will be considered informational submittals.
- B. For each material that contains VOC's, submit to the Architect five copies of an IAQ Submittal package containing the following information for record purposes. This package shall be submitted separately from the submittals required elsewhere for product review:
 1. Description of use of product, including estimated area of exposed surface.
 2. Product data.
 3. VOC data where applicable:
 - a. Fluid materials: Indicate content in g/L calculated according to 40 CFR 59, Subpart D (EPA method 24).
 - b. Solid materials: Provide VOC emission rates.
 4. Material Safety Data Sheet.
- C. For construction procedures required to protect Indoor Air Quality, submit the following information for record purposes:
 1. Construction Indoor Air Quality Management Plan.
 2. Product data for filtration media used during construction and installed at Substantial Completion, highlighting MERV and other performance data.
 3. Construction Documentation: Six photographs at three different occasions during construction along with a brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
 4. Signed statement 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.
- D. Evidence of testing of each substrate to receive mold-sensitive finishes in accordance with ASTM F2170.

- E. The Contractor's schedule shall include a period for Flush-out procedures as specified herein.

1.8 QUALITY ASSURANCE

- A. Comply with the following MCHPS requirements:

1. Massachusetts CHPS Indoor Environmental Quality Credit 2.5: Construction IAQ Building Flushout.
 - a. Develop and implement an Indoor Air Quality (IAQ) Management Plan for the preoccupancy phase in accordance with Massachusetts CHPS Indoor Environmental Quality Credit 2.5 procedures and requirements.
 - b. Provide a narrative including the following information:
 - The project's specific flushout procedures.
 - Flush-out schedule, start and finish dates.
 - Zone description of defined areas for flushout.
 - List of air handlers within each zone.
 - Filter media used during and after completion of flushout. (Reference Division 230000 specifications).
 - Flushout period calculations.

- B. Construction IAQ Management Plan: The General Contractor shall prepare a plan that complies with SMACNA Guidelines, to address the following issues and other IAQ issues as requested by the Owner:

1. Protection of ventilation system components during construction.
2. Measures designed to limit the presence of VOC's, dust and other contaminants during construction.
3. Procedures for drying out construction moisture
4. Procedures for drying out or otherwise dealing with unanticipated entry of water into new or existing construction.
5. Cleanup of contaminated components during construction and after construction is complete.
6. Provision of temporary ventilation and filters as required during construction.
7. Scheduling of construction activities to comply with IAQ requirements of this Section.

- C. Maintain in the Contractor's office a complete and up-to-date notebook of MSDS for all products on-site containing VOC's. Upon the request of the Owner, make the notebook available for review.

- D. Pre-testing of construction products to determine VOC emissions:

1. Testing shall conform to the provisions of ASTM D5116-97.
2. The Contractor shall provide pre-testing for the following:
 - a. Product substitutions proposed by the Contractor.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Throughout the Work, use products, materials which contribute the minimum practicable dust, odors and contaminants to the indoor environment.
- B. Products containing Volatile Organic Compounds (VOC's):
 - 1. Comply with the following criteria for VOC limits for the following field-applied products.
 - a. Adhesives: Refer to Technical Sections which include adhesives, including but not limited to those in Divisions 6 and 9, for specific requirements.
 - b. Sealants: Refer to Section 079200 – JOINT SEALANTS, and other Technical Sections requiring sealants, for specific requirements.
 - c. Paints and Coatings: Refer to Section 099000 – PAINTING AND COATING, for specific requirements.
 - 2. No urea formaldehyde-containing products will be permitted for use in this Project.
 - a. Wood and agrifiber products: Refer to Sections in Division 6 and 12 for products.
 - b. Insulation: Refer to Section 072100 – THERMAL INSULATION, for products.
 - 3. Where VOC limits are not otherwise specified, use products with maximum VOC content of 7% by volume.
 - 4. Comply with requirements of the specifications for all items containing VOC's.
 - 5. All materials containing VOC's shall be installed no less than fourteen days prior to Owner's occupancy of the building.
- C. Indoor Chemical and Pollutant Source Control:
 - 1. Provide temporary walk-off mats to reduce entry of dust, moisture and other contaminants into the building during construction.
 - 2. Refer to Section 124800 – ENTRANCE FLOOR MATS AND FRAMES, for permanent floor grilles to be installed at building entrances. These floor grilles shall be protected from dust, moisture and other contaminants until Substantial Completion.
- D. Mechanical Systems and Controls: Refer to Technical Sections in Division 21, 22, 23 and 26 for mechanical and electrical provisions for maintaining Indoor Air Quality.

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES FOR PROTECTING INDOOR AIR QUALITY

- A. General: Provide physical barriers, ventilation and other controls as specified to reduce potential for odors, dust, and fumes from affecting present and future occupants of the building, and to meet performance criteria specified herein.
- B. Material Transport and Storage:
 - 1. Store construction materials, including ductwork, in clean, dry areas protected from moisture and dust. Refer to Division 2 through 50 Sections for additional on-site storage requirements for individual materials and equipment.

INDOOR AIR QUALITY REQUIREMENTS

018119 - 6

SITE PLAN REVIEW APPLICATION- PROPOSED SPECIFICATION LANGUAGE

2. No storage of construction materials or debris will be permitted within mechanical rooms.
 3. Adsorptive materials shall be protected throughout storage at the site in their original wrapping materials.
 4. Keep waste materials that can release dust or odors covered and sealed when on site, and dispose of them promptly.
- C. Installation Sequence: Schedule material installation and construction activities so as to avoid adsorption of VOC's and dust into adsorptive materials.
1. Provide protective cover for adsorptive materials that will be subjected to VOC off-gassing and dust.
 - a. Wrap adsorptive materials in polyethylene or other impermeable material and seal edges with tape.
 - b. Refer to SMACNA Guidelines for minimum requirements.
 - c. Protective cover is required for uninstalled materials stored in the construction area, as well as for installed materials.
 2. Containers of VOC-containing fluids shall be kept tightly sealed. When not in use, such containers shall be stored in a location remote from adsorptive materials or occupied areas.
 3. Apply all wet materials such as paints, coatings and products installed with adhesives, allowing them time to offgas before applying adsorptive or "sink" type products such as.
 - a. Acoustical ceiling tiles
 - b. Carpet
 - c. Fabric materials, upholstered products or fabric-wrapped panels for use as tack-boards or acoustical purposes.
 4. Permit carpeting to offgas for 48 hours at the plant prior to wrapping in plastic wrappings. Otherwise, before installation, open up carpet rolls and spread carpet out in an offsite location and ventilate in an area protected from weather, sources of moisture or other VOC's.
- D. Regular Cleaning during Construction: Refer to Section 011400 – Work Restrictions, for cleaning provisions. The intent of these documents is to prevent accumulation of contaminant-containing dirt and dust within the building during construction.
1. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
 2. Use cleaning methods that minimize airborne dust. Recommended methods include:
 - a. Immediate removal of spills, excess applications of cleaning products and accumulated water.
 - b. Increased frequency of cleaning during construction, to maintain surfaces free of dust accumulation.
 - c. Use of wetting agents and sweeping compounds, and of efficient dust collection equipment such as damp mops and HEPA filtered vacuum cleaners.
 - d. Refer to SMACNA Guidelines for additional cleaning recommendations.
- E. Protection from VOC's from Asphalt- and Solvent-Containing Materials:
1. Sealing of air intakes or ventilation required to prevent waterproofing-generated VOC's from entering HVAC system or occupied areas will be performed under Section 079200 – Joint Sealants.
 2. Sealing of air intakes to prevent roofing-generated VOC's from asphalt or adhesives from entering HVAC system shall be performed under Division 07 – Roofing Sections.

3.2 MIXING OF MULTI-COMPONENT PRODUCTS

- A. General: Fluid-applied products furnished in two or more components shall be mixed thoroughly, in precise proportions so that an excess of one component will not remain uncured. The requirements of this section apply to all fluid-applied multi-component products, including but not limited to the following:
 - 1. Multi-component adhesives.
 - 2. Multi-component waterproofing and sealant products.
 - 3. Multi-component paints and coatings
 - 4. Multi-component fluid-applied floorings

- B. Requirements:
 - 1. All multi-component mixtures shall be brought to the Project Site in factory-sealed and pre-measured containers with precise quantities required for proportional mixing. No bulk materials will be permitted on-site if not packaged in this manner.
 - 2. Mix components in strict accordance with manufacturer's written instructions regarding quantities, mixing method and other conditions.
 - 3. Each container of each component shall be completely mixed with the entire contents of a corresponding container of the second component.
 - a. No field mixing of partial quantities will be permitted.
 - b. Properly dispose of mixed components remaining unused at the end of a workday.

3.3 CONTROL OF COMBUSTION PRODUCTS

- A. General: Minimize the use of fuel-burning equipment inside and near the building. Where fuel-burning engines are necessary, cycle off equipment when not in use.

- B. Vehicle Exhaust: No vehicles shall be left idling near temporary or permanent air intakes. Motorized vehicles used within the building shall be electrically powered.

- C. Power Equipment: No internal combustion engines shall be operated within the building. Location of engines outside the building shall be remote from permanent air intakes and operable windows of occupied spaces.

- D. Exhaust of Temporary Heating Equipment:
 - 1. No temporary heating equipment that burns kerosene or other liquid fuel will be permitted within the building.
 - 2. Temporary equipment that produces heat by combustion of fuel shall be installed with provisions to ventilate combustion gases to the exterior of the building.

- E. Welding: Welding operations shall be properly ventilated.

- F. Smoking: No smoking will be permitted within the construction site or adjacent areas at any time.

3.4 DUST CONTROL

- A. General: The following provisions do not supersede specific requirements for methods of construction or applicable general conditions set forth elsewhere in the Contract with regard to performance obligations of the Contractor.

PROPOSED SPECIFICATION LANGUAGE

1. Maintain the construction site, stockpiles, access, detour, and haul roads, staging and parking area used for the Work, free of dust that would cause a hazard or a nuisance to those at the site or adjacent sites. Refer to Section 310000 – EARTHWORK, for additional provisions for control of dust on the site.
2. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and use damp cloths and wetting agents or sweeping compounds to prevent air-borne dust from dispersing into the atmosphere.
3. Cutting of concrete and masonry products shall be performed using wet saw methods.
4. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
5. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
6. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces, including paint, coatings, sealants, caulking, adhesives.

B. Dust Partitions and Coverings:

1. Furnish, erect, and maintain for the duration of the work period, temporary fire-resistant dust-proof coverings and solid partitions as required to prevent the spread of dust beyond the immediate area where work is being performed.
2. Temporary partitions for dust control shall extend from floor to bottom of structure above, to provide an air-tight barrier. Provide air-tight coverings for openings required for access through partitions.
3. Cover equipment installed within construction area using canvas, polyethylene and tape, or other materials as recommended by manufacturer of equipment for protection from airborne dust and vapors.
4. Refer to Section 015000 – Temporary Facilities and Controls, for additional requirements for temporary partitions and related protective measures.

C. Prevent dust and odors from entering the new HVAC system. Confirm that the HVAC Subcontractor has sealed all diffusers, return side ductwork and equipment within the Work Area so as to prevent dust from entering. For further requirements, refer to SMACNA Guidelines and DIVISION 23 – Heating, Ventilating and Air Conditioning.

D. Prevent exterior dust and odors from entering interior space after building is enclosed. Whenever possible, seal window units with plastic as recommended in SMACNA Guidelines.

3.5 WATER DAMAGE

A. General: The General Contractor shall be responsible for protecting the Work from moisture, in order to prevent growth of harmful fungus, mold and other biological activity.

B. Protection of Existing and New Building Construction:

1. Refer to Section 015000 – Temporary Facilities and Controls, for materials and installation of weatherproof enclosures.
2. Remove and replace construction which becomes wet, or which shows evidence of biological growth due to the presence of moisture.

C. Protection of Stored Construction Materials:

1. Take precautions to prevent porous materials such as gypsum board, insulation, ceiling tile, wood and similar products from becoming wet.

INDOOR AIR QUALITY REQUIREMENTS

018119 - 9

2. Refer to Section 015000 – Temporary Facilities and Controls, for materials and installation of weatherproof enclosures.
 3. Store materials above ground surfaces and provide spacers between ground and protective covering to allow for ventilation
 4. Discard construction material which becomes wet, or which shows evidence of biological growth due to the presence of moisture.
- D. Procedures for drying out wet construction: In the case that an unanticipated event permits the entry of water into new or existing construction, the Contractor shall perform procedures to dry out construction within 24 hours, to a degree that will not support biological growth using restoration drying techniques.
1. Refer to guidelines published by the United States Environmental Protection Agency.
 2. Construction that is not adequately dried out, or which shows evidence of biological growth, shall be removed immediately from the construction area and disposed of legally.
 3. Wetting by contaminated water and subsequent cleaning and decontamination shall be supervised by a qualified company.

3.6 CLEAN UP

- A. Prior to turning over work area to Owner, conduct final cleaning to remove dust to the minimum practicable level.
- B. Clean ductwork, registers and grilles within the Work Area, and HVAC equipment servicing the Work Area using professional duct cleaning company.
- C. After completion of duct cleaning, vacuum vertical and horizontal surfaces, ledges, trim, tops of light fixtures and other equipment, and other locations where dust has settled. Utilize HEPA filtered vacuum to capture fine dust.
- D. Vacuum carpet tiles and fabric-covered surfaces with a high-efficiency particulate arrestor (HEPA) vacuum prior to Substantial Completion.
- E. Do not use solvent-based cleaners in final cleaning of Work Area, unless cleaning occurs at least 14 days prior to Owner's scheduled Active Use of the area.
- F. Coils, air filters and fans in HVAC system shall be cleaned prior to final testing and balancing. Refer to Division 23 – HVAC, for requirements.

3.7 SCHEDULED FLUSHOUT PROCEDURES

- A. General:
 1. Schedule Building Flush-Out prior to testing and balancing of mechanical systems, as outlined in Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION.
 2. No mechanical system start-up will be permitted until application of major finishes, installation of casework and final cleanup is complete.
- B. Building Flush-Out: Ventilate entire building with 100 percent outside air for a period of 28 calendar days. Refer to Division 15 Sections for requirements for filters, static pressure sensors, start-up and operation of mechanical systems.

C. Exterior Conditions for Flush-Out:

1. Remove potential sources of pollution from proximity to air intakes. Pollutant sources include but are not limited to: waste materials, temporary fuel-burning equipment, vehicles, dust-producing activities.
2. Control dust on the building site by spraying exposed soil with water and encouraging growth of permanent grass and other plant materials.
3. If unavoidable pollutant-generating activities occur outside the building during the flush-out period, seal building as recommended in SMACNA Guidelines, and discontinue flush-out until such activities cease.

D. Equipment Requirements During Flush-Out Period:

1. Temporary MERV 10 filters shall be in place before HVAC system start-up.
2. Windows shall be securely closed.
3. Disable carbon dioxide monitors.
4. Maintain normal room temperature.
5. Monitor filter pressure drop for each HVAC unit that contains filters, and replace filters if needed due to accumulation of particulate matter before the end of the period.

E. Replace temporary filters with new MERV 10 filters at completion of building flush-out.

3.8 INDOOR AIR QUALITY FIELD TESTING

A. Indoor Air Quality Testing, General:

1. The Owner reserves the right to conduct indoor air quality testing before, during and after construction, in order to quantify the effects of the Contractor's Indoor Air Quality Plan and verify that the Indoor Air Quality provisions of the Contract Documents are being met.
2. The Contractor shall cooperate with the Owner in scheduling the testing and providing access to the site.

END OF SECTION