

**APPENDIX C: INDOOR AIR QUALITY GUIDELINES****General**

The following guidelines must be met by both the Architect/Engineer (A/E) consultant and the contractor to assure indoor air quality of the building being provided. At the direction of the Project Manager, as additional services, independent tests/reports may be required to verify results.

The A/E shall complete an Indoor Air Quality Assessment indicating how indoor air quality standards detailed below will be implemented. The minimum Emission Rate Guidelines listed below relate to the building's cumulative emission rate from all sources due to construction materials and products such as wall coverings, flooring, ceiling tiles, adhesives, paints, sealants, insulation, duct work, wiring, and other materials, and furnishings anticipated to be used by the building's occupants, such as desks, chairs, partitions, bookcases, computers, and office equipment.

The A/E and contractor shall determine emission rates by obtaining the appropriate information, available in Material Safety Data Sheets (MSDS) and other requested testing certification from the product manufacturers, and by government agencies.

**Emission Rate Guidelines:** All materials used in the building shall emit the lowest, yet technologically achievable emissions of particles and chemical vapors. In particular, adhesives, paints and finishes, carpets, and furnishings made of particle board shall meet the specific emission rate standards for formaldehyde and volatile organic compounds (VOCs) below. As information is available, carpets shall meet the emission rate standard for 4-phenyl cyclohexene (4-PC). All emission rate calculations shall assume 900 cubic feet (25.49 cubic meters) volume of workspace per building occupant in the determination of maximum product loading.

**Formaldehyde Emission Rate Guideline:** The product emission rate, measured in  $\text{mg}/\text{m}^2$  per hour, shall not result in an indoor air concentration level of formaldehyde greater than 0.05 ppm, with indoor ambient conditions of 76°F and 60% relative humidity, at the anticipated maximum loading ( $\text{m}^2/\text{m}^3$  within the building).

**Total Volatile Organic (VOC) Emission Rate Guideline:** The product emission rate, measured in  $\text{mg}/\text{m}^2$  per hour, shall not result in an indoor air concentration level greater than 0.5  $\text{mg}/\text{m}^3$  of total volatile organic compounds at the maximum anticipated loading ( $\text{m}^2/\text{m}^3$  within the building).

**4-phenyl cyclohexene (4-PC) Emission Rate Guideline:** The product emission rate, measured in  $\text{mg}/\text{m}^2$  per hour, shall not result in an indoor air concentration level greater than 1 ppb at the maximum anticipated loading ( $\text{m}^2/\text{m}^3$  within the building).

**Regulated Pollutant Guideline:** Any pollutant regulated as a primary or secondary air pollutant, shall meet an emission rate standard that will not generate an air concentration greater than that promulgated by the National Ambient Air Quality Standard (U.S. EPA, Code of Federal Regulations, Title 40, Part 50).

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**Other Pollutant Guideline:** Any pollutant not specifically mentioned in the subparagraphs above shall meet an emission rate standard that will not produce an air concentration level greater than 1/10<sup>th</sup> the Threshold Limit Value – Time Weighted Average (TLV-TWA) industrial workplace standard at the anticipated loading in the building, based on ASHRAE 62-1989, or most recent revision, and the TLV-TWA industrial workplace standard as established by the most recent edition of the American Conference of Governmental Industrial Hygienists, 6500 Glenway, Building D-7, Cincinnati, Ohio 45211-4438. (Copies of ACGIH handbook will be available through the Texas Building and Procurement Commission.)

**Indoor Pollutant Source Control Plan**

The A/E shall develop the Indoor Pollutant Source Control Plan to reduce or eliminate potential problems relative thereto:

- Materials with pollutants, including (but not limited to) asbestos, carbon monoxide, formaldehydes, lead, smoke, fiberglass, allergens, and micro-organisms;
- Insufficient, filtered outside air;
- Outside air being drawn into the building from contaminated sources, such as building exhaust, vehicle exhaust, cooling towers (this will require an analysis of the prevailing winds to establish intake and exhaust locations);
- Negative building pressure;
- Microbial infestations, such as but not limited to infestations due to poor maintenance, stagnant water in drains and pans, or due to high humidity;
- Select materials with the least persistent emissions, and the lowest toxicity, with priority given to materials with lowest toxicity; and,
- Separate systems to exhaust directly to outside the building for locations that are expected to be continual emissions sources due to their prescribed use or equipment, (e.g., bathrooms, print shops, photography labs, smoking areas and storage rooms).

**Notification**

The A/E, or contractor if included in the specifications, shall provide written notification to all material suppliers of the requirement to comply with the Emission Rate Guidelines.

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The A/E, or contractor if included in the specifications, shall disclose in writing to the Project Manager prior to the installation of any materials, furnishings, and finishes, any detectable amounts of carcinogens (substances which are proven to cause cancer), mutagens (substances which are proven to cause mutations), or teratogens (substances which are proven to cause birth defects), such as formaldehyde, volatile organic compounds, and 4 phenyl cyclohexene identified in the following resource(s):

- IARC Monographs on the Evaluation of Carcinogenic Risks to Humans by International Agency for Research on Cancer, 1987 or latest revision;
- Fifth annual Report on Carcinogens by U.S. Department of Health and Human Services, 1989 or most recent revision;
- Catalog of Teratogenic Agents, Sixth Edition by Thomas H. Shepard, or most recent revision; and,
- Medical Databases, available from the Library of Medicine.

**Testing**

All emission rate testing pertinent to air quality shall be done in accordance with ASTM D5116-90, Small Scale Environmental Determination of Organic Emissions from Indoor Materials/Products. All test data shall be made available to the Commission upon request.

**Installation of "Wet" and "Dry" Materials**

During construction, the following procedures must be followed:

- When installing insulation, indoor areas shall be properly ventilated; ventilation systems shall be operational for 24 hours per day until perceptible odors due to emissions are eliminated.
- The least amount feasible of "wet" materials (i.e., adhesives, sealants, glazes, caulks, paints, etc. shall be used during construction and applications. Control strategies for achieving minimal use of "wet" materials shall be presented to the Commission for prior approval before such "wet" materials are used.
- "Dry" furnishings materials (such as carpet, acoustical panels, textiles) shall not be installed until "wet" materials have been applied and allowed to dry where possible. Drying times shall be chosen so pollutant emission rates, as set forth in section "B" above, are achieved prior to installation of "dry" furnishing materials.
- "Dry" furnishings and materials (such as carpet, floor tile, acoustical tile, textiles, office furniture, wood shelving) when appropriate, shall be allowed to "air-out" for three (3) days minimum, or until there is no noticeable odor or irritation prior to installation in a building.

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The IAQ assessment shall include a determination of the adequacy and effectiveness of the ventilation system and the control of indoor pollutant sources, based on ASHRAE Standard, Ventilation for Acceptable Indoor Air Quality, 62-1989, or most recent edition.

An analysis of the adequacy and effectiveness of the proposed mechanical HVAC system, including the following:

- Approximate location of building outdoor air intakes to ensure an acceptable quality of outdoor air.
- Approximate location of building exhausts and pollutant sources to prevent reentry of exhausted or polluted air into the building, such as loading docks and parking lots.
- Integration of building air intake and exhaust locations with the overall master site plan to optimize the quality of outdoor air intake for all buildings on adjacent sites.
- Overall conceptual design of the building exhaust system to ensure external exhaust of toxic pollutants and odors created in building support areas, in particular, print shops and medical facilities involved with infectious diseases, and, if required by Project Manager, treatment of those exhausts to eliminate particles and toxic pollutants from the air before exhausting it.
- Overall sizing of the HVAC system to provide:
  1. an adequate ventilation rate of outdoor air to the ultimate expected building population; and,
  2. additional outdoor air, as appropriate, for special purpose facilities.
- Conceptual design of the HVAC delivery system that will facilitate an adequate and effective pre-conditioned outdoor air ventilation rate to all occupants of the building as the use patterns and occupancy of the building changes over the years.
- Design to achieve acceptable ventilation effectiveness in the occupied zones – a well mixed air delivery system.
- Effective integration of the air delivery system with the occupied space activities and space design.
- Operational and material design of HVAC system to prevent the growth of all microbial debris, including make-up air.

An analysis of the overall conceptual design of the building to provide protection of its occupants against infiltration, both natural and stack effect, of the following:

- carbon monoxide, particles, and other pollutants from the parking areas, loading dock areas, smoking pavilion and other pollutant sources external to the building; and,
- radon from ground sources.

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An indoor pollutant source control plan addressing proposed measures to provide construction materials and interior finishes and furnishings, including, but not limited to, furniture, flooring, floor coverings, wall coverings, base ceiling tiles, adhesives and paints, which:

- conform to a maximum pollutant emission rate guideline or air quality standard as set forth in the Emission Rate Guidelines;
- have been tested using methods reasonably simulating an actual office environment by an independent testing facility prior to delivery to ensure compliance with the pollutant emission rate guideline or air quality standard;
- have been pre-conditioned prior to installation in the building, when appropriate; and,
- shall be asbestos- and lead-free, as defined by the U.S. Environmental Protection Agency.

**Indoor Air Quality Operations Plan**

The contractor shall provide a building interior air quality operations plan which includes, but is not limited to, the following:

- HVAC design and operating documentation as recommended by the equipment manufacturers and the design engineer.
- Initial balancing of the HVAC system at the occupied zone before Substantial completion and before Final Acceptance.
- A program of re-balancing of the HVAC system at each season change for one year after occupancy.
- A flush out period of high ventilation at ambient temperatures (100% outside air) totaling sixty (60) days, thirty (30) days of which shall take place after completion of all interior construction and prior to placing any furniture in the ventilated space, and thirty (30) days beginning after all furniture has been unpacked and placed in the ventilated space, all of which shall occur prior to Substantial Completion.
- An extended ventilation flush period after Substantial Completion of an additional ninety (90) days at the normal ventilation rate for seven days per week, twenty-four hours per day. (Implementation of this 90-day flush out is the Commission's responsibility).
- Comprehensive training of Commission's HVAC operators to properly use and maintain the ventilation system and a schedule for preventive maintenance.