

SECTION 018113.14 - SUSTAINABLE DESIGN REQUIREMENTS - LEED V4 BD+C: NEW CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide the work of this Section in accordance with requirements of the Contract Documents.
- B. This Section includes general requirements and procedures for compliance with Airport Green Building Standards (GBS) prerequisites and credits needed for the Project to comply with Airport Sustainability Report.
 - 1. Other GBS prerequisites and credits needed to obtain GBS certification are dependent on material selections and may not be specifically identified as GBS requirements. Compliance with requirements needed to obtain GBS prerequisites and credits may be used as one criterion to evaluate substitution requests.
 - 2. Additional GBS prerequisites and credits needed to obtain the indicated GBS certification are dependent on the Architect/Engineer's design and other aspects of the Project that are not part of the Work of the Contract.
 - 3. The GBS Project Checklist is included in Section 3 of the GBS.
- C. Section includes but is not limited to general requirements and procedures for compliance with USGBC's LEED prerequisites and credits needed for Project to obtain LEED Silver certification based on USGBC's "LEED Version 4 for Building Design and Construction" (hereafter, LEED v4 BD+C).
 - 1. Specific requirements for LEED are also included in other Sections.
 - 2. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
 - 3. A copy of LEED Project checklist is attached at end of this Section for information only.
 - a. Some LEED prerequisites and credits needed to obtain indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.

1.2 DEFINITIONS

- A. Alternative Daily Cover (ADC): Material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing, litter, and scavenging. Generally, these materials must be processed so they do not allow gaps in the exposed landfill face.
- B. Bio-based Materials: Bio-based products must meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Excluded are leather and other hide or animal skin products.
- C. BUG Rating: Classification system for luminaires defined in terms of backlight (B), uplight (U), and glare (G).

- D. Chain of Custody (CoC): The path taken by raw materials, processed materials, finished products, and co-products from the forest to the consumer, including each successive stage of processing, transformation, manufacturing and distribution.
- E. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001. Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body. A chain-of-custody certificate number on invoices for nonlabeled products indicates that the certifier's guidelines for product accounting have been followed. A chain-of- custody certification is not required by distributors of a product that is individually labeled with the Forest Stewardship Council logo and manufacturer's chain of custody number. CoC certification requirements are determined by Forest Stewardship Council Chain of Custody Standard 40-004 v2-1.
- F. Commingled Waste: Building waste streams that are combined on the project site and hauled away for sorting into recyclable streams. Also known as single-stream recycling.
- G. Composite Wood: Manufactured materials made from wood or agricultural fibers manufactured with bonding agents. Composite wood materials include particle board, medium density fiberboard (MDF), plywood, strawboard, wheatboard, panel substrates and door cores.
- H. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- I. Cradle-to-Gate Assessment: Analysis of a product's partial life-cycle from extraction (cradle) to gate (factory completion prior to distribution).
- J. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- K. Environmental Product Declaration (EPD): An EPD is a standard format for communicating environmental impacts of a product's life-cycle, including extraction, energy use, chemical makeup, waste generation, and emissions. Three types of EPDs are recognized by LEED Building Product Disclosure and Optimization credits:
 - 1. Products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.
 - 2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071. Products with product-specific internal EPDs which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
 - 3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. Products with industry-wide EPDs, which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
 - 4. Product-specific Type III EPD -- Products which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope, with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.
- L. Extended Producer Responsibility (EPR): Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life.

- M. Forest Stewardship Council (FSC) Certified Content: Permanently installed wood content that has been harvested in accordance from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Recycled wood fiber that qualifies as contributing to MR Credit Recycled Content is excluded from FSC Certified Content.
- N. GBCI - Green Building Certification Institute: The Green Building Certification Institute (GBCI) body with responsibility for administering the LEED certification program previously administered by the U.S. Green Building Council® (USGBC®).
- O. General Emissions Evaluation: Emissions testing and requirements of products and materials per the California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v1.2-2017).
- P. Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction."
- Q. LEED: The Leadership in Energy & Environmental Design (LEED) rating system developed by the United States Green Building Council. LEED is a system of assigning Credits (points) to a projects based on sustainable building goals being met. LEED has Prerequisites, which are required for the project to qualify.
- R. LEED: USGBC's "LEED Version 4/4.1 for Building Design and Construction." Definitions that are part of this document apply to this Section.
- S. Life-Cycle Assessment: Evaluation of environmental impacts of a product from cradle to gate, defined by ISO 14040 and ISO 14044.
- T. Life-Cycle Inventory: Database that defines environmental input and output for each step in a material or assembly's life cycle.
- U. Material Cost: The hard cost as provided by the contractor or sub-contractor for a permanently installed material or assembly, excluding the cost of on-site labor and equipment. Material cost is calculated as the product of the unit price for the material or assembly times the cost per unit.
- V. Materials Reuse: Reuse includes salvaged, refurbished, or reused products.
- W. Nonemitting Materials: Naturally occurring materials and products that are made from inorganic materials are considered by LEED to be inherently nonemitting materials for the purposes of the Low-Emitting Materials credits because they emit either very low or no VOCs. These products do not require VOC emissions testing or certification. Inherently nonemitting materials that are excepted from low-emitting material documentation must have no integral organic-based surface coatings, binders, or sealants. These products include:
 - 1. Natural stone
 - 2. Untreated and unfinished solid wood flooring (no exception for non-floor application or for engineered wood)
 - 3. Ceramics
 - 4. Powder-coated metals, plated metals or anodized metals
 - 5. Glass
 - 6. Concrete
 - 7. Clay brick

- X. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
1. "Postconsumer" material is defined as waste material generated by end users (households or commercial, industrial, and institutional facilities of a product, which can no longer be used for its intended purpose, that is recycled into raw material for a new product.
 2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Reutilization of materials (such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it) is excluded.
- Y. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- Z. Recycling: The collection, processing, and use of materials that were diverted or recovered from the solid waste stream.
- AA. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Professional association that provides standards for sheet metal work.
- BB. Source Separated: Construction or demolition waste materials that are sorted into separate bins on the project site (aka on-site). This waste strategy often isolates waste materials targeted for reuse, donation, or recycling programs. Typically, sorted materials on-site include metals, wood, ceiling tiles, furniture, and concrete.
- CC. Total Materials Cost: Total Materials Cost includes costs for all permanently installed material on the project and any furniture in the project scope. This typically includes all products from Divisions 3-10, Division 12, Division 31 (Sections 31.6x.xx) and Division 32 (Sections 32.1x.xx, 32.3x.xx and 32.9x.xx) where 'x' indicates all individual sections with the same first three numerals. Total cost can include "passive" portions of the MEP systems (not active equipment), such as ductwork, pipes, etc. at the project team's discretion.
1. All MEP items are excluded.
 2. Special equipment such as elevators, escalators, process equipment, and fire suppression systems are excluded.
 3. Temporary materials are excluded.
- DD. Volatile Organic Compounds (VOC's): A carbon compound that vaporizes at normal room temperatures. VOC's contribute to air pollution directly and through atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate) to produce secondary air pollutants, principally ozone and peroxyacetyl nitrate."
- EE. Urea-formaldehyde: A combination of urea and formaldehyde used in some glues and adhesives, particularly in composite wood products. At room temperature, urea-formaldehyde emits formaldehyde, a toxic and possibly carcinogenic gas."
- FF. Solar Reflectance Index (SRI): The measure of a constructed surface's ability to stay cool in the sun by reflecting solar radiation and emitting thermal radiation. SRI values range from zero (solid black surface) to 100 (solid white surface). SRI value of a material is calculated according

to ASTM E1980 and based on the aged tested values of solar reflectance and thermal emittance.

GG. Vertical Illuminance: Illuminance levels calculated at a point on a vertical surface or plane.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site. Review LEED requirements and action plans for compliance with requirements.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Respond to questions and requests from Architect and the GBCI regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the GBCI has made its determination on the Project's LEED certification application. Document responses as informational submittals.
- B. LEED Project Administrator: Responsible for administration of LEED Certification Application.
1. Architect/Engineer.

Retain one of two paragraphs in this article. Retain first if Architect or Owner submits LEED documentation to USGBC; retain second if Contractor does.

- A. Contractor's Responsibilities:
1. Respond to questions and requests from Architect about USGBC's LEED prerequisites and credits that are Contractor's responsibility, that depend on product selection or product qualities, or that depend on Contractor's procedures, until USGBC has made its determination on Project's LEED certification application.
 2. Submit and maintain documentation to USGBC through LEED Credits Online, and respond to questions and requests from USGBC about its LEED prerequisites and credits that are Contractor's responsibility, that depend on product selection or product qualities, or that depend on Contractor's procedures, until USGBC has made its determination on Project's LEED certification application.
 3. Document correspondence with USGBC as informational submittals.
- B. LEED Status Meetings:
1. LEED Project Manager and Owner's Representative will conduct regularly scheduled meetings to review Project Status. These may be conducted concurrently with other Project Meetings required by Division 01 Section "Project Management and Coordination."

1.5 ACTION SUBMITTALS

Requirements in this article assume that Product Data and cost information are submitted to Architect, who then either fills out the LEED online forms or forwards the submittals to Owner or Sustainability Consultant to fill out the forms. Submittals include documentation needed to verify compliance with LEED requirements so that Architect, Owner, or Sustainability Consultant can be assured, when filling out the online forms, that requirements have been met. Although USGBC's LEED reference guides do not specifically identify who can certify compliance, submittals could be deleted if requirements in this Section

are revised to require Contractor to fill out the online forms and to notify Architect or Owner as when completed.

- A. General: Refer to the LEED scorecard, technical sections of the Specifications and this Section for responsibilities regarding documentation. The Architect/Engineer will review documentation before it is submitted to LEED online.
 - 1. The Contractor and other LEED team members are responsible for online documentation of construction related information required for LEED compliance
 - 2. Submit additional sustainable design submittals required by other Sections.
 - 3. Maintain copies of LEED compliance submittals for confirmation of compliance at Project completion.
 - 4. Submittals shall include the LEED submittal coversheet provided in Division 1, or equivalent, noting LEED product attributes as required per the applicable technical section.
- B. GBS Submittals:
 - 1. Submit any additional GBS submittal requirements included in other Sections.
 - 2. GBS submittals are in addition to other submittals. If the submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated the GBS and Airport Sustainability Report requirements.
- C. Sustainable design submittals are in addition to other submittals, but shall be processed at the same time as other submittals are processed.
 - 1. If submitted item(s) are identical to those proposed to comply with other requirements, include separate additional copies with other submittal as a record of compliance with indicated LEED requirements instead of separate sustainable design submittal. Mark additional copy "Sustainable design submittal."

Submittals in "Sustainable Design Documentation Submittals" Paragraph below may be necessary to verify compliance with indicated USGBC LEED prerequisites and credits. Additional submittals may be required in other Sections.

- D. Sustainable Design Documentation Submittals: Review technical sections of the specifications and provide the following documentation pertinent to their work
 - 1. Energy Performance Compliance: For equipment and appliances, indicate compliance with requirements for Energy Star rated equipment and appliances
 - 2. Environmental Product Declarations complying with LEED requirements.
 - 3. Documentation for luminaires indicating BUG ratings, lumens emitted, and vertical illuminance values.
 - 4. Documentation for compliant paving materials indicating the SRI, SR, and permeability.
 - 5. Documentation for compliant roofing materials indicating the SRI.
 - 6. Product Data and certification for WaterSense-labeled water fixtures.
 - 7. Product Data for plumbing fixtures indicating flush or flow rate.
 - 8. Documentation complying with Division 01 Sections "General Commissioning Requirements," and "Exterior Enclosure Commissioning," Division 21 Section "Commissioning of Fire Suppression," Division 22 Section "Commissioning of Plumbing," Division 23 Section "Commissioning of HVAC," and Division 26 Section "Commissioning of Electrical Systems."
 - 9. Environmental Product Declarations (EPDs) complying with LEED requirements.
 - 10. Documentation for products that comply with LEED requirements for multi-attribute optimization.

- a. Include documentation for regional materials, indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material and costs of regional materials.
 - b. Include documentation for any applicable third-party certifications.
11. Sustainability reports for products that comply with LEED requirements for raw material and source extraction reporting.
12. Documentation for products that comply with LEED requirements for leadership extraction practices. Include the following:
 - a. Product Data and certification letter from product manufacturers, indicating participation in an extended producer responsibility program and statement of costs.
 - b. Product Data and certification for bio-based materials, indicating that they comply with requirements. Include statement of costs.
 - c. Product Data and chain-of-custody certificates for products containing certified wood. Include invoices.
 - d. Receipts for salvaged and refurbished materials used for Project, indicating sources and costs.
 - e. Product Data and certification letter from product manufacturers, indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement of costs.
 - f. Documentation for regional materials, indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material and costs of regional materials.
13. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting.
14. Documentation for products that comply with LEED requirements for material ingredient optimization.
15. Documentation for products that comply with LEED requirements for product manufacturer supply chain optimization.
 - a. Include documentation for regional materials, indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material and costs of regional materials.
16. Documentation complying with Section 017419 "Construction Waste Management and Disposal."
17. Waste Management Plan: Contractor's LEED Compliance Officer/Construction Sustainability Manager shall be responsible for the development and implementation of a Construction Waste Management Plan for the Project. Submit plan to collect, sort, deposit waste and recyclable materials in accordance with the approved plan within 7 working days of date established for the Notice of Award.
18. Product Data for adhesives and sealants used inside weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials.
19. Product Data for paints and coatings used inside weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials.
20. Laboratory test reports for flooring, indicating compliance with requirements for low-emitting materials.
21. Laboratory test reports for products containing composite wood or agrifiber products or wood glues, indicating compliance with requirements for low-emitting materials.
 - a. Product Data: For non-structural composite wood products, indicating that product is compliant with CARB ATCM requirements for No Added Formaldehyde (NAF)

- resins or Ultra-Low Emitting Formaldehyde (ULEF) resins per CARB ATCM criteria.
- b. Product Data: For structural composite wood products, indicating that product has been tested per EN 717-1:2014 as compliant with emissions class E1. Structural composite wood, with no added urea-formaldehyde resins or surface treatments, and certified per the following: PS 1-09 or PS 2-10 for plywood, PS 2-10 for OSB, ASTM D 5446-13 for structural composite lumber, ANSI A190.1-2012 for Glue-laminated timber, PRG 320-15 for cross-laminated timber, and labeled heat resistant per DOC PS-20 2015 for finger-jointed lumber.
22. Laboratory test reports for ceilings, walls, and thermal insulation, indicating compliance with requirements for low-emitting materials.
23. Laboratory test reports for furniture, indicating compliance with requirements for low-emitting materials.
24. Construction Indoor-Air-Quality (IAQ) Management:
- a. Construction IAQ management plan.
 - b. Product Data for temporary filtration media.
 - c. Product Data for filtration media used during occupancy.
 - d. Construction Documentation: Six photographs at three different times during construction period, along with brief description of SMACNA approach employed, documenting implementation of IAQ management measures, including protection of ducts and on-site stored or installed absorptive materials.
 - e. Filter replacement schedule or other documentation that new filtration media has been installed in each air-handling unit (as approved by the mechanical engineer) immediately prior to occupancy, and date of this replacement.

Delete "IAQ Assessment" Subparagraph below if using Owner-engaged IAQ testing.

25. IAQ Assessment:

Retain first two subparagraphs below if using building air flush-out procedures.

- a. Signed statement describing the building air flush-out procedures, including dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
- b. Product Data for filtration media used during flush-out and occupancy.

Retain subparagraph below if using Contractor-engaged IAQ testing.

- c. Report from testing and inspecting agency indicating results of IAQ testing and documentation that show compliance with IAQ testing procedures and requirements.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED Compliance Officer.
- B. Submittals shall include the LEED submittal coversheet provided in Division 1, or equivalent, noting LEED product attributes as required per the applicable technical section.
- C. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project and cost items that comply with sustainable requirements specified, for work included under technical sections of the work. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Plumbing.
 2. Mechanical.
 3. Electrical.
 4. Specialty items such as elevators and equipment.
 5. Wood-based construction materials excluding components of mechanical, electrical, plumbing or specialty items such as elevators and equipment. Include statement indicating total material cost for all new, permanently-installed wood-based materials used for Project. Material costs exclude labor, equipment, overhead, and profit.
- D. Sustainable Design Action Plans: Provide preliminary submittals within 14 days of date established for the Notice to Proceed, indicating how the following requirements will be met:
1. List of proposed products with Environmental Product Declarations (EPDs).
 2. List of proposed products complying with requirements for multi-attribute optimization.
 3. List of proposed products complying with requirements for raw material and source extraction reporting.
 4. List of proposed products complying with requirements for leadership extraction practices.
 5. List of proposed products complying with requirements for material ingredient reporting.
 - a. Published manufacturer inventory of ingredients identified by name and Chemical Abstract Service Registration Number (CASRN).
 - b. Documentation that product has been certified as Cradle to Cradle v3 with a Material Health achievement level of Bronze or better.
 - c. Declare product label indicating that all ingredients have been disclosed down to 1000 ppm.
 - d. 'LBC Compliant,' and indicating that all ingredients have been disclosed down to 1000 ppm (0.1%).
 - e. 'Red List Free' or 'Declared.'
 - f. Documentation that product has been certified at the Bronze level or higher under the Cradle to Cradle v3 Material Health Certificate.
 - g. Product Lens Certification.
 - h. Documentation confirming certification under Facts NSF/ANSI 336 Sustainability Assessment for Commercial Furnishings Fabric at any certification level.
 - i. Assessor documentation or scorecard from BIFMA demonstrating that furniture product has earned 3 points under 7.5.1.3 Advanced Level in e3-2014 or 3 points under 7.4.1.3 Advanced Level in e3-2012 for ANSI/BIFMA e3 Furniture Sustainability Standard.
 - j. Living Product Challenge certified products with Declare label indicating ingredients have been disclosed down to 1000 ppm (0.1%).
 6. List of proposed products complying with requirements for material ingredient optimization.
 - a. Material Ingredient Screening and Optimization Action Plan (valued at 1/2 product): Documentation confirming material ingredient screening to at least 0.1% (1000 ppm), and development of a detailed action plan to mitigate or reduce known hazards using the principles of green chemistry. The action plan must be product specific and must include all of the following:
 - 1) Description of the screening or assessment platform used.
 - 2) Identification of the specific green chemistry principles targeted for implementation.
 - 3) Description of specific steps anticipated in implementation, including proposed changes in formulation or manufacturing processes.
 - 4) Specific dates and a timeline for completion of steps described.

- b. Advanced Inventory & Assessment (valued at 1 product): Documentation confirming the end use product meets any of the following:
 - 1) Declare labels designated as Red List Free that are third-party verified.
 - 2) Cradle to Cradle: Materials Health Certificate or Cradle to Cradle certified under standard version 3 or later, with a Material Health category achievement level at Bronze or higher.
 - 3) Living Product Challenge certified products with 'Red List Free' Declare Label.
 - c. Material Ingredient Optimization (valued at 1.5 products): Documentation confirming product inventory and assessment of ingredients using any of the following:
 - 1) Living Product Challenge: Products certified to the Living Product Challenge which includes achievement of Imperative 09: Transparent Material Health.
 - 2) Cradle to Cradle version 3 certified with a Material Health category achievement level at Silver or higher, or a Materials Health Certificate at Silver or higher.
 - 7. List of proposed products complying with requirements for product manufacturer supply chain optimization.
 - 8. List of products that comply with diversion goals in the Waste management plan complying with Division 01 Section "Construction Waste Management and Disposal."
 - 9. List of products that are required to comply with the Construction IAQ management plan.
- E. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans.
- F. Waste Reduction Progress Reports: Include the following information for each individual waste stream:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons (tonnes).
 - 4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
 - 5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
 - a. Recycled waste quantity must exclude any waste used for alternative daily cover (ADC). ADC counts as landfill waste.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
 - 8. Include legible copies of on-site logs, weight tickets and receipts with the Waste Reduction Progress Reports. Receipts shall be from recycling and/or disposal site operators who can legally accept the materials for the purpose of reuse, recycling, or disposal. The waste contractors shall have the original documents (as above) for the life of the project plus three (3) years.
 - 9. Include verification from waste facility that ADC has been excluded from quantities of recycled waste.
- G. Submit documentation (including Construction Waste Management and Disposal plan, waste calculations, and completed LEED Online credit form) to USGBC, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met. Respond to questions and requests from USGBC regarding construction waste management and disposal until the USGBC has

made its determination on the Project's LEED certification application. Document correspondence with USGBC as informational submittals.

1.7 QUALITY ASSURANCE

- A. Sustainable Design Program: The Contractor and Subcontractors shall be responsible for implementing processes, programs, means and methods required to insure compliance with sustainable design requirements and objectives of the Contract Documents, including but not limited to the following:
1. Reviewing and vetting submittals for technical sections with respect to compliance with Sustainable Design Requirements.
 2. Product and Execution requirements specified in various sections of the project specifications.
 3. Proposed LEED points that specifically address construction execution issues material reporting requirements and indoor air quality testing requirements.

Requiring that Contractor engage a LEED AP to coordinate LEED requirements may help avoid inadvertent errors that could jeopardize Project's LEED certification if Contractors' personnel have limited experience.

- B. LEED Compliance Officer: Engage an experienced LEED Accredited Professional to coordinate LEED requirements.
1. Qualifications: The LEED Compliance shall have experience with sustainable design issues related to the design and construction of projects of equal size and scope to this one, with at least two years of experience implementing the LEED rating system on other projects.
 2. Other Duties: The LEED Compliance Officer shall be assigned to manage construction administration of the Sustainable Design program, and may also manage the Waste Management and Construction Indoor Air Quality Programs.
- C. Responsibilities of Subcontractors: Each subcontractor shall coordinate LEED submittal requirements and process delivery of certifications and LEED substantiation documents through the Contractor's LEED Compliance Officer, who in turn will coordinate with the A/E Team.
- D. Responsibilities of the LEED Compliance Officer: The LEED Compliance Officer shall perform the following services:
1. General: Take primary responsibility for organizing and managing the process of compiling requirements of the construction-related LEED Points for which the Contractor and each Subcontractor is responsible, including collecting and organizing the documentation required for the Architect/Engineer's submission to the USGBC upon completion of the project.
 2. IAQ Program: Develop appropriate and comprehensive Construction Indoor Air Quality (IAQ) Management Plan, as required under the LEED Construction Indoor Air Quality Management Credit. The LEED Compliance Officer shall be responsible for implementing construction activity pollution prevention, verifying compliance, enforcing, and documenting implementation of the Construction IAQ Management Plan. Each Subcontractor shall comply with the requirements of this program.
 3. Construction Waste Management: Develop a Construction Waste Management Plan, as required under the LEED Construction Waste Management credit for diversion of waste from landfill. The Contractor shall be responsible for verifying compliance, enforcing and documenting implementation of the Construction Waste Management Plan.

4. LEED Compliant Materials: Assist the Subcontractors in identifying and obtaining supporting documentation for products that satisfy the specified sustainable design and specified product requirements (for example, low VOC sealants and adhesives; recycled content; regionally extracted and manufactured materials, and other items listed in this Section). Each Subcontractor shall coordinate with the LEED Compliance officer and provide documentation in a timely manner as required for filing by the A/E team.
 5. LEED Progress Meetings: Assist the Architect/Engineer in scheduling, conducting and distributing minutes of record the Architect/Engineer takes at regularly scheduled LEED progress meetings consisting of members of the Contractor, Subcontractors, Architect/Engineer, Commissioning Agent and the Owner.
 6. Schedules and Tracking: Prepare schedules and tracking documentation for circulation to construction contracting team members for the purposes of organizing the sustainable design compliance responsibilities of each team member.
 7. Observation and Inspection: Perform periodic on site observations and inspections of the work in progress in order to verify conformance with all required sustainable design requirements. These observations shall occur not less than once per week.
 8. Documentation: Provide documentation content for the Architect/Engineer's formal LEED submission documentation, as required by the US Green Building Council to verify conformance with the LEED rating system.
- E. The services described above (by the LEED Compliance Officer) shall not preclude nor substitute for the requirements of other dedicated sustainable design related services that the project may require, (such as an industrial hygienist that may be required to satisfy specific LEED point requirements for construction indoor air quality control), or general construction supervision required on a full or part-time basis to verify.
- F. VOC Compliance for High Performance Coatings: Provide materials that comply with the Air Quality Control regulations of the local Air Quality Management District having jurisdiction over the location of the project or EPA Region II. In the event that local regulations are silent on specific applications, comply with the National Volatile Organic Compound Emission Standards for Architectural Coatings (40 CFR Part 59).
- G. Preconstruction Conference: Preconstruction Conferences for LEED and Indoor Air Quality shall be convened as specified in Division 01 Section "Project Management and Coordination."
- H. Project Meetings: LEED Coordination Conferences shall be convened as specified in Division 01 Section "Project Management and Coordination."
- I. Reference Standards: Except where more stringent requirements are stated, comply recommendations and requirements of the following reference standards (latest edition at the time of Award):
1. LEED NC BD+C Reference Guide.
 2. South Coast Air Quality Management District (SCAQMD) Rule #1168, Adhesive and Sealant Applications.
 3. South Coast Air Quality Management District (SCAQMD) Rule #1113, Architectural Coatings.
 4. Green Seal Standard GS-36, Commercial Adhesives, requirements.
 5. Green Seal Standard GS-11, Paints.
 6. Green Seal Standard GC-03, Anti-Corrosive Paints.
 7. FloorScore
 8. California Department of Public Health (CDPH) Standard Method V1.1-2010.
 9. Carpet and Rug Institute Green label Program.

PART 2 - PRODUCTS

2.1 SUSTAINABLE DESIGN - PERFORMANCE CRITERIA:

- A. Performance criteria listed below represent overall project wide criteria. Individual sections of the Specifications contain specific thresholds selected by the Architect/Engineer in order to comply with LEED credits targeted to achieve the LEED Silver certification level. The Contractor can vary from individually targeted percentages and thresholds stated in individual sections of the specifications, as long as the overall percentages for the LEED credit is achieved as required to provide a LEED v4 BD+C Silver certification level.
- B. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.
- C. Specific performance criteria for individual products and systems are listed in each of the technical sections. If product specific performance criteria cannot be met, the CONTRACTOR shall be responsible for providing alternative products which ensure that the overall project wide performance will still be achieved. All product substitutions must comply with requirements of Division 01 Section "Substitution Procedures".

2.2 MATERIALS

- A. Provide products and procedures necessary to obtain LEED credits indicated as Contractor's responsibility. Although other Sections may specify some requirements that contribute to these LEED credits, Contractor shall provide additional materials and procedures necessary to obtain LEED credits indicated.
- B. Energy Star: All dishwashers and ice machines must be Energy Star rated.
- C. At least 20 different products from at least five different manufacturers shall have EPDs that comply with LEED requirements. Industrywide (generic) EPDs shall be valued as one-half of a product.
- D. At least 50 percent, by cost, of permanently installed products for Project shall comply with LEED requirements for multi-attribute optimization.
- E. At least 20 different products from at least five different manufacturers shall have publicly released reports that comply with LEED requirements for raw material source and extraction reporting. Self-declared reports by manufacturers shall be valued as one-half of a product.
- F. At least 20 different products from at least five different manufacturers shall comply with LEED requirements for material ingredient reporting.
- G. At least 10 different products from at least three different manufacturers shall comply with LEED requirements for material ingredient optimization.
- H. At least 25 percent, by cost, of permanently installed products for Project shall comply with LEED requirements for product manufacturer supply chain optimization.

- I. Not less than 25 percent of building materials, by cost, shall comply with LEED requirements for leadership extraction practices.
 1. Structure and enclosure materials shall not be more than 30 percent, by cost, of materials used to comply with this requirement.
- J. Extended Producer Responsibility Program: Not less than 25 percent of building materials, by cost, shall be manufactured by a participant in an extended producer responsibility program.
- K. Recycled Content: Building materials shall have recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content for Project constitutes a minimum of 25 percent of cost of materials used for Project.
 1. Cost of postconsumer recycled content plus one-half of preconsumer recycled content of an item shall be determined by dividing weight of postconsumer recycled content plus one-half of preconsumer recycled content in the item by total weight of the item and multiplying by cost of the item.
 2. Do not include plumbing, mechanical and electrical components, and specialty items, such as elevators and equipment, in the calculation.
 3. Recycled (Recovered) Material Content Requirements: Unless otherwise specified, the following are minimum recovered material content requirements for products listed.

A. Table: Minimum Recycled (Recovered) Material Content Requirements

Div	Material Category	Minimum Recycled (Recovered) Content (by weight)	Ref #
05	Framing steel, made using EAF (electric arc furnace)	97% total; 64% post-consumer	2
	Steel sheet metal, made using BOF (basic oxygen furnace)	30% total; 17% post-consumer	2
06	Laminated paperboard (sheathing, underlayment, subflooring)	100%	1
	Countertops, solid-surface plastic	100% post-consumer	6
	Plastic lumber, non-structural	100%	1
07	Building insulation, mineral wool batt or board	75%	1
	Building insulation, fiberglass batt or board	25%	1
	Building insulation, polyisocyanurate, polyurethane	9%	1
	Building insulation, foam-in-place rigid foam	5%	1
	Building insulation, phenolic rigid foam	5%	1
	Building insulation, perlite composite board	75% post-consumer paper	1
	Building insulation, cotton and/or polyester batt	100%	6
	Building insulation, plastic non-woven batt	100% recovered plastic	1
	Building insulation, cellulose, loose-fill or spray-in	95% post consumer	6
	Applied fireproofing	100%	6
	Roofing, steel	100% total; 67% post-consumer	5
	Roofing, aluminum	95%	5
	Roofing, fiber (felt)	100%	5
	Roofing, rubber	100%	5

Div	Material Category	Minimum Recycled (Recovered) Content (by weight)	Ref #
	Roofing, plastic or plastic/rubber composite	100%	5
	Roofing, wood/plastic composite	100%	5
09	Gypsum board gypsum core	98% recycled or synthetic gypsum	7
	Gypsum board facing paper	100% post-consumer newsprint	6
	Steel studs, runners, and channels	30%	2
	Acoustic ceiling tiles	65%	7
	Ceiling suspension system, steel	30%	2
	Ceramic tile	50%	6
	Rubber flooring	95%	1
	Carpet, polyester face fiber	100% PET (Polyethylene Terephthalate)	1
	Carpet, nylon face fiber	25%	5
	Carpet backing, vinyl	100%	5
	Carpet cushion, bonded polyurethane	50%	1
	Carpet cushion, jute	40% burlap	1
	Carpet cushion, synthetic fiber	100% carpet fabrication scrap	1
	Carpet cushion, rubber	90%	1
	Fabric wrapped tack panel core	100% post-consumer paper	6
10	Shower and restroom partitions, plastic	100%	1
	Restroom partitions, metal	100%	1
	Signage, plastic	100%	1
	Signage, aluminum	25%	1
	Signage, steel	30%	1
11	Loading dock bumpers, rubber	100%	6
12	Entrance mats, rubber	100%	6
	Office furniture, PET fabric	100%	5
22	Non-pressure pipe, steel	100% total; 67% post-consumer	5
	Non-pressure pipe, HDPE	100%	5
	Non-pressure pipe, PVC	100%	5
32	Geotextile, synthetic	100%	6
	Hydromulch	100% post-consumer paper	1
	Unit pavers, rubber and/or plastic	95%	1
	Paving, grass- or gravel-filled structural grid system	100%	6
	Paving, asphalt	50% RAP (reclaimed asphalt paving)	5
	Paving, rubber modified (RMA)	25%	5
	Paving, "glassphalt"	10% recycled glass cullet aggregate	5
	Drip irrigation hose	70%	1
	Parking appurtenances, concrete	70%	1
	Parking appurtenances, plastic and/or rubber	100%	1

Table A References for Minimum Recovered Material Content Requirements:

1. US EPA "Wastes - Resource Conservation - Comprehensive Procurement Guidelines" (<http://www.epa.gov/epawaste/conservation/tools/cpg/>) (latest update as of October 2007).
 2. This standard references Steel Recycling Institute (<http://www.recycle-steel.org>) published industry averages for recycled steel content. Meeting these criteria ensures that products meet or exceed the industry trends for recycling.
 3. Green Seal Standard "Watering Hoses (GC-01)", Second Edition, April 4, 1994
 4. EPA Recovered Materials Advisory Notice (RMAN), August 28, 2001 TxDOT (<http://www.dot.state.tx.us>) recommendations for recycled content in asphalt. Contact TxDOT for additional information.
 5. Products that meet this standard are widely available throughout North America.
 6. No standard is cited for this requirement.
- B. Certified Wood: Not less than 50 percent, by cost, of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.
- C. , "FSC Principles and Criteria for Forest Stewardship." Organizations involved in manufacture of wood based products, shall comply with FSC-STD-40-004 for product classification.
1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
 - a. Rough carpentry.
 - b. Miscellaneous carpentry.
 - c. Heavy timber construction.
 - d. Wood decking.
 - e. Metal-plate-connected wood trusses.
 - f. Structural glued-laminated timber.
 - g. Finish carpentry.
 - h. Wood veneers.
 - i. Architectural woodwork.
 - j. Plywood.
 - k. Composite boards.
 - l. Packing crates, pallets, and boxes.
 - m. Wood paneling.
 - n. Wood doors.
 - o. Wood veneer wall covering.
 - p. Wood flooring.
 - q. Wood lockers.
 - r. Wood cabinets.
 - s. Furniture.
 2. Refer to Division 06 Sections for requirements for certified fabricators.
- D. Achieve end-of-Project rates for salvage/recycling of percentage of 75 percent; by weight of total non-hazardous solid waste generated by the Work. Track project-specific waste from a minimum of 4 individual streams. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

2.3 LOW-EMITTING MATERIALS

- A. Paints and Coatings: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the

following VOC content limits, and verified with SCAMQMD Rule 1168 when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 50 g/L.
 3. Dry-Fog Coatings: 150 g/L.
 4. Primers, Sealers, and Undercoaters: 100 g/L.
 5. Rust-Preventive Coatings: 100 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Clear Wood Finishes, Varnishes: 275 g/L.
 9. Clear Wood Finishes, Lacquers: 275 g/L.
 10. Floor Coatings: 50 g/L.
 11. Shellacs, Clear: 730 g/L.
 12. Shellacs, Pigmented: 550 g/L.
 13. Stains: 100 g/L.
- B. Paints and Coatings: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings by volume for emissions and 100% VOC content shall comply with requirements of CARB2007 (SCM) for architectural coatings SCAQMD rule 1113, effective June 3, 2011, and California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," CDPH Standard Method v1.2.
- C. Adhesives and Sealants: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with VOC content limits of authorities having jurisdiction South Coast Air Quality Management Board (SCAQMD) Rule 1168 (effective Oct. 6, 2017), and the following VOC content limits:
1. Wood Glues: 30 g/L.
 2. Metal-to-Metal Adhesives: 30 g/L.
 3. Adhesives for Porous Materials (except Wood): 50 g/L.
 4. Subfloor Adhesives: 50 g/L.
 5. Plastic Foam Adhesives: 50 g/L.
 6. Carpet Adhesives: 50 g/L.
 7. Carpet Pad Adhesives: 50 g/L.
 8. VCT and Asphalt Tile Adhesives: 50 g/L.
 9. Cove Base Adhesives: 50 g/L.
 10. Gypsum Board and Panel Adhesives: 50 g/L.
 11. Rubber Floor Adhesives: 60 g/L.
 12. Ceramic Tile Adhesives: 65 g/L.
 13. Multipurpose Construction Adhesives: 70 g/L.
 14. Fiberglass Adhesives: 80 g/L.
 15. Contact Adhesives: 80 g/L.
 16. Structural Glazing Adhesives: 100 g/L.
 17. Wood Flooring Adhesives: 100 g/L.
 18. Structural Wood Member Adhesives: 140 g/L.
 19. Single-Ply Roof Membrane Adhesives: 250 g/L.
 20. Special-Purpose Contact Adhesives (That Are Used to Bond Melamine-Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch (1.6 mm) or Less in Thickness to Any Surface): 250 g/L.
 21. Top and Trim Adhesives: 250 g/L.
 22. Plastic Cement Welding Compounds: 250 g/L.
 23. ABS Welding Compounds: 325 g/L.
 24. CPVC Welding Compounds: 490 g/L.
 25. PVC Welding Compounds: 510 g/L.

26. Adhesive Primer for Plastic: 550 g/L.
 27. Sheet-Applied Rubber Lining Adhesives: 850 g/L.
 28. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
 29. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
 30. Special-Purpose Aerosol Adhesives (All Types): 70 percent by weight.
 31. Other Adhesives: 250 g/L.
 32. Architectural Sealants: 250 g/L.
 33. Nonmembrane Roof Sealants: 300 g/L.
 34. Single-Ply Roof Membrane Sealants: 450 g/L.
 35. Other Sealants: 420 g/L.
 36. Sealant Primers for Nonporous Substrates: 250 g/L.
 37. Sealant Primers for Porous Substrates: 775 g/L.
 38. Modified Bituminous Sealant Primers: 500 g/L.
 39. Other Sealant Primers: 750 g/L.
- D. Adhesives and Sealants: For field applications that are inside the weatherproofing system, 90 percent of adhesives and sealants (by volume) shall comply with emissions requirements of California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," CDPH Standard Method v1.2.
- E. Exterior Applied Products: For field applications that are outside the weatherproofing system, applied products shall comply with the following VOC content limits of the California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings and South Coast Air Quality Management District.
- F. Flooring: 100% of Flooring shall comply with requirements of California Department of Public Health's (CDPH) "Standard Method v1.2-2017 for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Composite Wood, Agrifiber Products, and Adhesives: Shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in California Air Resources Board's (CARB) "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" to meet the CARB ATCM for formaldehyde requirements of ultra low-emitting formaldehyde (ULEF) resins or shall be made with no added formaldehyde.
1. Non-structural composite wood products shall be made using ultra-low-emitting formaldehyde resins or have no added formaldehyde as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products, v1.2".
 2. Structural composite wood products shall be tested per EN 717-1:2014 as compliant with emissions class E1. Structural Composite Wood, with no added urea-formaldehyde resins or surface treatments, and certified per the following:
 - a. PS 1-09 or PS 2-10 for plywood
 - b. PS 2-10 for OSB
 - c. ASTM D 5446-13 for structural composite lumber
 - d. ANSI A190.1-2012 for Glue-laminated timber
 - e. PRG 320-15 for cross-laminated timber
 - f. Labeled heat resistant per DOC PS-20 2015 for finger-jointed lumber
- H. Ceilings, Walls, and Thermal Insulation: Shall comply with requirements of California Department of Public Health's (CDPH) "Standard Method v1.2-2017 for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers", using the applicable exposure scenario.

1. Manufacturer or 3rd party certification shall state the exposure scenario used to determine compliance.
2. Claims of compliance for wet applied products shall state the amount applied in mass per surface area, also state the range of total VOCs after 14 days measured as specified in CDPH Standard:
 - a. 0.5mg/cubic meter or less;
 - b. Between 0.5 and 5 mg/cubic meter; or
 - c. 5 mg/cu meter or more.

PART 3 - EXECUTION

3.1 NONSMOKING BUILDING

- A. Smoking is not permitted within the building or within 25 ft. (8 m) of entrances, operable windows, or outdoor-air intakes.

3.2 CONSTRUCTION WASTE MANAGEMENT

- A. Comply with Division 01 Section "Construction Waste Management and Disposal."

3.3 CONSTRUCTION INDOOR-AIR-QUALITY (IAQ) MANAGEMENT

- A. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
 1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 01 Section "Temporary Facilities and Controls," install MERV 8 filter media at each return-air inlet for the air-handling system used during construction.
 2. Remove temporary filter media before commencing HVAC system testing and balancing and before occupancy. Sequence Work for occupancy and HVAC system testing and balancing to occur after dust and dirt generating construction activities are complete.
 3. Replace air filters installed in HVAC ductwork and equipment immediately prior to occupancy with new filters specified in Division 23 Section "Particulate Air Filtration."

3.4 INDOOR-AIR-QUALITY (IAQ) ASSESSMENT

- A. Flush-Out:
 1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14,000 cu. ft. (4 300 000 L) of outdoor air per sq. ft. (sq. m) of floor area while maintaining an internal temperature of at least 60 deg F (16 deg C) and a relative humidity no higher than 60 percent.
 2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. (1 070 000 L) of outdoor air per sq. ft. (sq. m) of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. (1.52 L/s per sq. m) of outside air or the design minimum outside air rate, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cu. ft./sq. ft. (4 300 000 L/sq. m) of outside air has been delivered to the space, , with internal

temperature of at least 60 deg F and no higher than 80 deg F and relative humidity at occupied controlled relative humidity level and no higher than 60% .

- a. Begin flushout 3 hours before daily occupancy and continue throughout the occupied portion of the day.
- b. Volume: To be determined at LEED Conference.
- c. Duration of Flushout: To be determined at LEED Conference.
- d. If permanent filters are in place, replace used HVAC filtration media with new media. Remove any temporary filters or duct coverings installed as part of the construction indoor air quality management plan

B. Air-Quality Testing: Owner will engage testing agency to perform the following:

1. Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in USGBC's "LEED Reference Guide for Building Design and Construction v4."
2. Demonstrate that contaminant maximum concentrations listed below are not exceeded:
 - a. Formaldehyde: 27 ppb.
 - b. Particulates (PM10): 50 mcg/cu. m.
 - c. Ozone: 0.075 ppm, according to ASTM D5149.
 - d. Total Volatile Organic Compounds (TVOC): 500 mcg/cu. m.
 - e. 4-Phenylcyclohexene (4-PH): 6.5 mcg/cu. m.
 - f. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
 - g. Target Chemicals in California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Table 4-1 (except formaldehyde). Allowable concentrations in California Department of Public Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Table 4-1.
3. For each sampling point where maximum concentration limits are exceeded, , conduct additional flush-out with outdoor air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the initial test. Take corrective action until requirements have been met.
4. Air-sample testing shall be conducted as follows:
 - a. All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside airflow rate for the occupied mode throughout the duration of the air testing.
 - b. Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
 - c. Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 5000 sq. ft. (465 sq. m). For large open spaces, one sampling point per 50,000 sq. ft. (4654 sq. m) may be used.
 - d. Air samples shall be collected between 3 and 6 ft. (0.9 and 1.8 m) from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION