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Section 01 81 13*

## SECTION 01 81 13 – SUSTAINABLE DESIGN REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes general requirements and procedures for achieving the most environmentally conscious Work possible within the limits of the Construction Schedule, Contract Sum, and available materials, equipment, and products.

#### 1.2 OBJECTIVES

- A. To obtain acceptable Indoor Air Quality (IAQ) for the completed project and minimize the environmental impacts of the construction and operation, the Contractor during the construction phase of this project shall implement the following procedures singly or in combination:
  - 1. Select products that minimize consumption of non-renewable resources, consume reduced amounts of energy and minimize amounts of pollution to produce, and employ recycled and/or recyclable materials. To help government purchasers incorporate environmental considerations into purchasing decisions, it is the intent of this project to conform with EPA's Five Guiding Principles on environmentally preferable purchasing. The five principles are:
    - a. Include environmental considerations as part of the normal purchasing process.
    - b. Emphasize pollution prevention early in the purchasing process.
    - c. Examine multiple environmental attributes throughout a product's or service's life cycle.
    - d. Compare relevant environmental impacts when selecting products and services.
    - e. Collect and base purchasing decisions on accurate and meaningful information about environmental performance.
  - 2. Control sources for potential IAQ pollutants by controlled selection of materials and processes used in project construction in order to attain superior IAQ.
  - 3. Products and processes that achieve the above objectives to the extent currently possible and practical have been selected and included in these Construction Documents. The Contractor is responsible to maintain and support these objectives in developing means and methods for performing the work of this Contract and in proposing product substitutions and/or changes to specified processes.

### 1.3 DEFINITIONS

- A. Agrifiber Products: Composite panel products derived from agricultural fiber
- B. Biobased Product: As defined in the 2002 Farm Bill, a product determined by the Secretary to be a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials
- C. Biobased Content: The weight of the biobased material divided by the total weight of the product and expressed as a percentage by weight
- D. Certificates of Chain-of-Custody: Certificates signed by manufacturers certifying that wood used to make products has been tracked through its extraction and fabrication to ensure that it was obtained from forests certified by a specified certification program
- E. Composite Wood: A product consisting of wood fiber or other plant particles bonded together by a resin or binder
- F. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair and demolition operations. A construction waste management plan is to be provided by the Contractor as defined in Section 01 74 19.
- G. LEED: The Leadership in Energy & Environmental Design green building rating systems developed and adopted by the U.S. Green Building Council (USGBC). The systems certify levels of environmental achievement based on a point and credit scoring system.
- H. LEED NC: The Leadership in Energy & Environmental Design green building rating system developed and adopted by the USGBC for new construction and major renovations of buildings

- I. LEED EB: The Leadership in Energy & Environmental Design green building rating system developed and adopted by the USGBC for operating and maintaining existing buildings
- J. Light Pollution: Light that extends beyond its source such that the additional light is wasted in an unwanted area or in an area where it inhibits view of the night sky
- K. Recycled Content Materials: Products that contain pre-consumer or post-consumer materials as all or part of their feedstock
- L. Post-Consumer Recycled Content: The percentage by weight of constituent materials that have been recovered or otherwise diverted from the solid-waste stream after consumer use
- M. Pre-Consumer Recycled Content: Materials that have been recovered or otherwise diverted from the solid-waste stream during the manufacturing process. Pre-consumer content must be material that would not have otherwise entered the waste stream as per Section 5 of the FTC Act, Part 260 "Guidelines for the Use of Environmental Marketing Claims": [www.ftc.gov/bcp/grnrule/guides980427](http://www.ftc.gov/bcp/grnrule/guides980427)
- N. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 250 miles (400 km) from the Project site
- O. Salvaged or Reused Materials: Materials extracted from existing buildings in order to be reused in other buildings without being manufactured
- P. Sealant: Any material that fills and seals gaps between other materials
- Q. Type 1 Finishes: Materials and finishes which have a potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing.
- R. Type 2 Finishes: "Fuzzy" materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals offgassed by Type 1 finishes or may be adversely affected by particulates. These materials become "sinks" for deleterious substances which may be released much later, or collectors of contaminants that may promote subsequent bacterial growth.
- S. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

## 1.4 SUBMITTALS

- A. General: Additional Sustainable Design submittal requirements are included in other sections of the Specifications.
- B. Sustainable Design Submittals:
  - 1. Alternative Transportation: Provide manufacturer's cut sheets for all bike racks installed on site, including the total number of bicycle storage slots provided. Also, provide manufacturer's cut sheets for any alternative-fuel refueling stations installed on site, including fueling capacity information for an 8-hour period.
  - 2. Heat Island Effect:
    - a. Site Paving: Provide manufacturer's cut sheets for all impervious paving materials, highlighting the Solar Reflectance Index (SRI) of the material. Also, provide cut sheets for all pervious paving materials.
    - b. Roofing Materials: Submittals for roofing materials must include manufacturer's cut sheets or product data highlighting the Solar Reflectance Index (SRI) of the material.
  - 3. Exterior Lighting Fixtures: Submittals must include cut sheets with manufacturer's data on initial fixture lumens above 90° from nadir for all exterior lighting fixtures, and, for parking lot lighting, verification that the fixtures are classified by the IESNA as "full cutoff" (FCO); OR provide documentation that exterior luminaires are IDA-Approved as Dark-Sky Friendly by the International Dark Sky Association (IDA) Fixture Seal of Approval Program.
  - 4. Irrigation Systems: Provide manufacturer's cut sheets for all permanent landscape irrigation system components and for any rainwater harvesting system components, such as cisterns.
  - 5. Water Conserving Fixtures: Submittals must include manufacturer's cut sheets for all water-consuming plumbing fixtures and fittings (toilets, urinals, faucets, showerheads, etc.) highlighting maximum flow rates and/or flush rates. Include cut sheets for any automatic faucet-control devices.
  - 6. Process Water Use: Provide manufacturer's cut sheets for all water-consuming commercial equipment (clothes washers, dishwashers, ice machines, etc.), highlighting water consumption performance. Include manufacturer's cut sheets or product data for any cooling towers, highlighting water consumption estimates, water use reduction measures, and corrosion inhibitors.
  - 7. Elimination of CFCs AND HCFCs: Provide manufacturer's cut sheets for all cooling equipment with manufacturer's product data, highlighting refrigerants; provide manufacturer's cut sheets for all fire-suppression equipment, highlighting fire-suppression agents; provide manufacturer's cut-sheets for all polystyrene insulation (XPS) and

closed-cell spray foam polyurethane insulation, highlighting the blowing agent(s).

8. Appliances and Equipment: Provide copies of manufacturer's product data for all Energy Star eligible equipment and appliances, including office equipment, computers and printers, electronics, and commercial food service equipment (excluding HVAC and lighting components), verifying compliance with EPA's Energy Star program.
9. On-Site Renewable Energy Systems: Provide cut sheets and manufacturer's product data for all on-site renewable energy generating components and equipment, including documentation of output capacity.
10. Measurement and Verification Systems: Provide cut sheets and manufacturer's product data for all controls systems, highlighting electrical metering and trending capability components.
11. Salvaged or Reused Materials: Provide documentation that lists each salvaged or reused material, the source or vendor of the material, the purchase price, and the replacement cost if greater than the purchase price.
12. Recycled Content: Submittals for all materials with recycled content (excluding MEP systems equipment and components) must include the following documentation:
  - a. Cost of each material or product, excluding cost of labor and equipment for installation
  - b. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre-consumer recycled content (by weight) of each material or product
  - c. An electronic spreadsheet that tabulates the Project's total materials cost and combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value) expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate, on an ongoing basis, line items for each material, including cost, pre-consumer recycled content, post-consumer recycled content, and combined recycled content value.
13. Regional Materials: Submittals for all products or materials expected to contribute to the regional calculation (excluding MEP systems equipment and components) must include the following documentation:

- a. Cost of each material or product, excluding cost of labor and equipment for installation
  - b. Location of product manufacture and distance from point of manufacture to the Project Site
  - c. Location of point of extraction, harvest, or recovery for each raw material in each product and distance from the point of extraction, harvest, or recovery to the Project Site
  - d. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of manufacture for each regional material
  - e. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of extraction, harvest, or recovery for each regional material or product, including, at a minimum, gravel and fill, planting materials, concrete, masonry, and GWB
  - f. An electronic spreadsheet that tabulates the Project's total materials cost and regional materials value, expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate on an ongoing basis, line items for each material, including cost, location of manufacture, distance from manufacturing plant to the Project Site, location of raw material extraction, and distance from extraction point to the Project Site.
14. Biobased Products:
- a. Rapidly Renewable Products: Submittals must include written documentation from the manufacturer declaring that rapidly renewable materials are made from plants harvested within a ten-year or shorter cycle and must indicate the percentage (by weight) of these rapidly renewable components contained in the candidate products, along with the costs of each of these materials, excluding labor and delivery costs.

- b. Certified Wood: Submittals for all wood-based materials must include a statement indicating the cost of each product containing FSC Certified wood, exclusive of labor and delivery costs, and third party verification of certification from one of the following:
  - 1) Certificates of chain-of-custody from manufacturers certifying that specified certified wood products were made from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2 "Principles and Criteria." Letter from approved Canadian Standards Association (CSA) supplier for verifying compliance with CSA Standard Z809-02 and Standard CSA Plus 1163.
  - 2) Documentation from the supplier verifying that 100% of the wood-based content originates from SFI third-party certified forest lands, identifying the company or companies that performed the SFI third-party certification for both the forest land management and the certified product content.
- 15. Outdoor Air Delivery Monitoring: Provide manufacturer's cut sheets highlighting the installed carbon dioxide monitoring system components and sequence of controls shop drawing documentation, including CO<sub>2</sub> differential set-points and alarm capabilities.
- 16. Interior Adhesives and Sealants: Submittals for all field-applied adhesives and sealants, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content.
  - a. Provide manufacturers' documentation verifying all adhesives used to apply laminates, whether shop-applied or field-applied, contain no urea-formaldehyde.
- 17. Interior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content
- 18. Exterior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on ambient air quality, must include manufacturer's MSDSs or other manufacturer's Product Data highlighting VOC content.
- 19. Floorcoverings:
  - a. Carpet Systems: Submittals for all carpet must include the following:
    - 1) A copy of an assessment from the Building for Environmental and Economic Sustainability (BEES) software model, either Version 3.0 or 4.0, with



parameters of the model set as described by this specification section.

- 2) Manufacturer's product data verifying that all carpet systems meet or exceed the testing and product requirements of the Carpet and Rug Institute Green Label Plus program.
  - b. Resilient Flooring: Submittals for all resilient floorcovering must include manufacturer's product data verifying certification under either the UL GREENGUARD for Gold or FloorScore indoor emissions testing program.
  - c. Engineered Wood Flooring and Bamboo Flooring: Submittals for all engineered wood flooring and bamboo flooring must include manufacturer's product data verifying certification under either the UL GREENGUARD or FloorScore indoor emissions testing program.
20. Composite Wood and Agrifiber Binders: Submittals for all composite wood and agrifiber products (including but not limited to particleboard, wheatboard, strawboard, agriboard products, engineered wood components, solid-core wood doors, OSB, MDF, and plywood products) must include manufacturer's product data verifying that these products contain no urea-formaldehyde resins.
  21. Systems Furniture and Seating: Provide manufacturer's product data verifying that all systems furniture and seating products meet the requirements of one of the following:
    - a. UL GREENGUARD certification
    - b. SCS Indoor Advantage certification
    - c. SCS Indoor Advantage Gold certification
    - d. BIFMA Standard X7.1-2005, as tested to BIFMA method M7.1-2005 and as verified by an independent laboratory
    - e. Calculated indoor air concentration limits for furniture systems and seating determined by the U.S. EPA's Environmental Technology Verification Large Chamber Test Protocol for Measuring Emissions of VOCs and Aldehydes (September 1999) testing protocol as conducted in an independent air quality testing laboratory
  22. Entryway Systems: Provide manufacturer's cut sheets for all walk-off systems installed to capture particulates, including permanently installed grates, grilles, slotted systems, direct glue-down walk-off mats, and non-permanent roll-out mats.

23. Air Filtration: Provide manufacturer's cut sheets and product data highlighting the following:
    - a. Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs)
    - b. Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed AHUs are used during construction
  24. Mercury in Lighting: Provide manufacturer's cut sheets or product data for all fluorescent or HID lamps highlighting mercury content.
  25. Lighting Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all lighting controls systems components.
  26. Thermal Comfort Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all thermal comfort-control systems components.
  27. Blended Cement: It is the intent of this specification to reduce CO<sub>2</sub> emissions and other environmentally detrimental effects resulting from the production of portland cement by requiring that all concrete mixes, in aggregate, utilize blended cement mixes to displace 40% of the portland cement typically included in conventional construction. Provide the following submittals:
    - a. Copies of concrete design mixes for all installed concrete
    - b. Copies of typical regional baseline concrete design mixes for all compressive strengths used on the Project
    - c. Quantities in cubic yards of each installed concrete mix
  28. Gypsum Wall Board: Provide manufacturer's cut sheets or product data verifying that all gypsum wallboard products are moisture and mold-resistant.
  29. Fiberglass Insulation: Provide manufacturer's cut sheets or product data verifying that fiberglass batt insulation contains no urea-formaldehyde.
  30. Duct Acoustical Insulation: Provide manufacturer's cut sheets or product data verifying that mechanical sound insulation materials in air distribution ducts consists of an impervious, non-porous coatings that prevent dust from accumulating in the insulating materials.
  31. Green Housekeeping: Provide documentation that all cleaning products and janitorial paper products meet the VOC limits and content requirements of this specification section.
- C. Project Materials Cost Data: Provide a spreadsheet in an electronic file indicating the total cost for the Project and the total cost of building materials used for the Project, as follows:
1. Not more than 60 days after the Preconstruction Meeting, the General Contractor shall provide to the Owner and Architect a preliminary

schedule of materials costs for all materials used for the Project organized by specification section. Exclude labor costs and all mechanical, electrical, and plumbing (MEP) systems materials and labor costs. Include the following:

- a. Identify each reused or salvaged material, its cost, and its replacement value.
  - b. Identify each recycled-content material, its post-consumer and pre-consumer recycled content as a percentage the product's weight, its cost, its combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value), and the total combined recycled content value for all materials as a percentage of total materials costs.
  - c. Identify each regional material, its cost, its manufacturing location, the distance of this location from the Project site, the source location for each raw material component of the material, the distance of these extraction locations from the Project site, and the total value of regional materials as a percentage of total materials costs.
  - d. Identify each biobased material, its source, its cost, and the total value of biobased materials as a percentage of total materials costs. Also provide the total value of rapidly renewable materials (materials made from plants that are harvested in less than a 10-year cycle) as a percentage of total materials costs.
  - e. Identify each wood-based material, its cost, the total wood-based materials cost, each FSC Certified wood material, its cost, and the total value of FSC Certified wood as a percentage of total wood-based materials costs.
2. Provide final versions of the above spreadsheets to the Owner and Architect not more than 14 days after Substantial Completion.
- D. Construction Waste Management: See Section 01 74 19 "Construction Waste Management" for submittal requirements.
- E. Construction Indoor Air Quality (IAQ) Management: Submittals must include the following:
1. Not more than 30 days after the Preconstruction Meeting, prepare and submit for the Architect and Owner's approval, an electronic copy of the draft Construction IAQ Management Plan in an electronic file including, but not limited to, descriptions of the following:
    - a. Construction procedures for meeting or exceeding the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 1995, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling

- b. Construction procedures for protecting absorptive materials stored on-site or installed from moisture damage
  - c. Schedule of submission to Architect of photographs of on-site construction IAQ management measures such as protection of ducts and on-site stored oil installed absorptive materials
  - d. Construction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille
  - e. Construction procedure for replacing all air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit
2. Not more than 30 days following receipt of the approved draft CIAQMP, submit an electronic copy of the approved CIAQMP in an electronic file, along with the following:
- a. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for all filtration media to be installed at return air grilles during construction if permanently installed AHUs are used during construction.
  - b. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs).
3. Not more than 14 days after Substantial Completion provide the following:
- a. Documentation verifying required replacement of air filtration media in all air handling units (AHUs) after the completion of construction and prior to occupancy and, if applicable, required installation of filtration during construction.
  - b. A minimum of 18 Construction photographs: Six photographs taken on three different occasions during construction of the SMACNA approaches employed, along with a brief description of each approach, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
4. A copy of the report from testing and inspecting agency documenting the results of IAQ testing, demonstrating conformance with IAQ testing procedures and requirements defined in Section 01 81 09 "Testing for Indoor Air Quality."
- F. Commissioning: See Section 01 91 00 "General Commissioning Requirements" for submittal requirements.

- G. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports for the following:
  - 1. Construction Waste Management: Waste reduction progress reports and logs complying with the requirements of Section 01 74 19 "Construction Waste Management."
  - 2. Construction IAQ Management: See details below under Section 3.2 Construction Indoor Air Quality Management for Construction IAQ management progress report requirements.

## 1.5 QUALITY ASSURANCE

- A. General: Perform the work of this Section as a supplement and in accordance with applicable requirements of Division 1 "Contractor Quality Control Program."
- B. Preconstruction Meeting: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner, Architect, and all Subcontractors to discuss the Construction Waste Management Plan, the required Construction Indoor Air Quality (IAQ) Management Plan, and all other Sustainable Design Requirements. The purpose of this meeting is to develop a mutual understanding of the Project's Sustainable Design Requirements and coordination of the Contractor's management of these requirements with the Contracting Officer and the Construction Quality Manager.
- C. Construction Job Conferences: The status of compliance with the Sustainable Design Requirements of these specifications will be an agenda item at all regular job meetings conducted during the course of work at the site.

## PART 2 - PRODUCTS

### 2.1 PRODUCT ENVIRONMENTAL REQUIREMENTS

- A. Site Clearing: Topsoil shall be provided by the Contractor from on-site material which has been stockpiled for reuse. Off-site borrow should only be used when on-site sources are exhausted. Chip and/or compost on site all vegetated material identified for removal.
- B. Do not burn rubbish, organic matter, etc. or any material on the site. Dispose of legally in accordance with Specifications Sections 01 74 19.
- C. Site Paving: All site impervious paving must be light colored, with a Solar Reflectance Index (SRI) of at least 29.

- D. Roofing Materials: All roofing systems, other than vegetated roof systems, must comply with the following requirements:
1. Low-Sloped roofing less than or equal to 2:12 slope must have an SRI of at least 78.
  2. Steep-Sloped roofing greater than 2:12 slope must have an SRI of at least 29.
- E. Exterior Lighting Fixtures:
1. All exterior luminaires must emit 0% of the total initial designed fixture lumens at an angle above 90° from nadir and/or meet the requirements of the Dark Sky certification program.
  2. Exterior lighting cannot exceed 80% of the lighting power densities defined by ASHRAE/IESNA Standard 90.1-2004, Exterior Lighting Section, without amendments.
  3. No lighting of building facades or landscape features is permitted.
- F. Herbicides and Pest Control: Herbicides shall not be permitted, and pest control measures shall utilize EPA-registered biopesticides only.
- G. Irrigation Systems: Any permanent landscape irrigation systems must be supplied entirely by collected rainwater or graywater and must be comprised of below-grade drip emitters controlled by moisture sensors. Timer controls shall not be permitted.
- H. Water-Conserving Fixtures: Plumbing fixtures and fittings shall use in aggregate at least 40% less water than the water use baseline calculated for the building after meeting the Energy Policy Act of 1992 fixture performance requirements. Flow and flush rates shall not exceed the following:
1. Toilets: no more than 1.3 gallons per flush, otherwise be dual flush 1.6/0.8 gallons per flush, and have documented bowl evacuation capability per MaP testing of at least 400 grams
  2. Urinals: no more than 0.125 gallons per flush or use
  3. Lavatory Faucets: 0.5 gpm with automatic faucet controls
  4. Kitchen Sink Lavatories: 2.2 gpm
  5. Showerheads: no more than 1.5 gpm

- I. Process Water Use: Employ strategies that in aggregate result in 20% less water use than the process water use baseline for the building after meeting the commercial equipment and HVAC performance requirements as listed in the Table below. For equipment not addressed by EPACT 2005 or the list below, additional equipment performance requirements may be proposed provided documentation supporting the proposed benchmark or industry standard is submitted.
  1. Clothes Washer: 7.5 gallons/cubic foot/cycle
  2. Dishwasher with Racks: 1.0 gallons/rack
  3. Ice Machine: 20 gallons/100 pounds ice for machines making over 175 pounds of ice per day; 30 gallons/100 pounds ice for machines making less than 175 ice per day. Avoid water-cooled machines.
  4. Food Steamer: 2 gallons/hour. Use only boilerless steamers.
  5. Pre-Rinse Spray Valves: 1.4 gallons/minute
  6. Kitchen Pot-Washing Sinks: 2.2 gallons/minute
  7. Cooling Towers: 2.3 gallons/ton-hr. water loss
    - a. Use atrazine-based corrosion inhibitors and reducing bleed-off by increasing cycles of concentration (at least 5, or with water quality problems limit to 4).
    - b. Install meters on make-up water and discharge blow-down.
    - c. Install conductivity controller for blow-down.
    - d. Provide overflow alarm connected to central building controls.
    - e. Install drift eliminators.

- f. Provide makeup water from sources other than potable water supply.
- J. Elimination of CFCs AND HCFCs:
  - 1. Ozone Protection: Base building cooling equipment shall contain no refrigerants other than the following: HCFC-123, HFC-134a, HFC-245fa, HFC-407c, or HFC 410a.
  - 2. Fire suppression systems may not contain ozone-depleting substances.
  - 3. Extruded polystyrene insulation (XPS) and closed-cell spray foam polyurethane insulation shall not be manufactured with hydrochlorofluorocarbon (HCFC) blowing agents.
- K. Appliances and Equipment: All Energy Star eligible equipment and appliances, including office equipment, computers and printers, electronics, and commercial food service equipment (excluding HVAC and lighting components), shall be qualified by EPA's Energy Star program.
- L. HVAC Distribution Efficiency:
  - 1. All duct systems shall be constructed of galvanized sheet metal, aluminum, or stainless steel as deemed appropriate based on the application requirements. No fiberglass duct board shall be permitted.
  - 2. All medium- and high-pressure ductwork systems shall be pressure-tested in accordance with the current SMACNA standards.



3. All ductwork shall be externally insulated. No interior duct liner shall be permitted.
  4. Where possible, all air terminal connections shall be hard-connected with sheet metal ductwork. If flexible ductwork is used, no flexible duct extension shall be more than six feet in length.
  5. All HVAC equipment shall be isolated from the ductwork system with flexible duct connectors to minimize the transmittance of vibration.
  6. All supply and return air branch ducts shall include the appropriate style of volume damper. Air terminal devices such as grilles, registers, and diffusers shall be balanced at duct branch dampers, not at terminal face.
- M. Measurement and Verification: Install controls and monitoring devices as required by division 15 and 16 in order to comply with International Performance Measurement & Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction, April 2003, Option D.
- N. Salvaged or Reused materials: There shall be no substitutions for specified salvaged and reused materials and products.
- O. Recycled Content of Materials:
1. Provide building materials with recycled content such that post-consumer recycled content value plus half the pre-consumer recycled content value constitutes a minimum of 30% of the cost of materials used for the Project, exclusive of all MEP equipment, labor, and delivery costs. The Contractor shall make all attempts to maximize the procurement of materials with recycled content.
    - a. The post-consumer recycled content value of a material shall be determined by dividing the weight of post-consumer recycled content by the total weight of the material and multiplying by the cost of the material.

- b. The pre-consumer recycled content value of a material shall be determined by dividing the weight of pre-consumer recycled content by the total weight of the material and multiplying by the cost of the material.
- c. Do not include mechanical and electrical components in the calculations.
- d. Do not include labor and delivery costs in the calculations.
- e. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).
- f. Utilize all on-site existing paving materials that are scheduled for demolition as granulated fill, and include the cost of this material had it been purchased in the calculations for recycled content value.
- g. At a minimum, the materials in the following list must contain the minimum recycled content indicated:

<b>Category</b>	<b>Minimum Recycled Content</b>
Compost/mulch	100% post-consumer
Asphaltic Concrete Paving	25% post-consumer
Cast-in-Place Concrete	6% pre-consumer
CMU: Gray Block	20% pre-consumer
Steel Reinforcing Bars	90% combined
Structural Steel Shapes	90% combined
Steel Joists	75% combined
Steel Deck	75% combined
Steel Fabrications	60% combined
Steel Studs	30% combined
Steel Roofing	30% post-consumer
Aluminum Fabrications	35% combined
Rigid Insulation	20% pre-consumer
Batt insulation	30% combined

Cellulose Insulation	90% combined
Rock Wool Insulation	75% pre-consumer
Fireproofing	20% combined
Steel Doors and Frames	35% combined
Gypsum Wallboard	100% combined
Carpet	40% combined
Ceramic Tile Flooring	60% combined
Rubber Flooring and Base	60% combined
Acoustical Ceiling Tile (ACT)	40% post-consumer
ACT Suspension System	90% post-consumer
Toilet Partitions	60% post-consumer

- P. Regional Materials: Provide a minimum of 20 percent of building materials (by cost) that are manufactured and extracted/harvested within a 250 mile radius of the project site, exclusive of labor and delivery costs. The Contractor shall make all attempts to maximize the procurement of materials within this specified 250 mile radius.

Q. Biobased Products:

1. Use only biobased concrete form-release products.
2. Solid Wood Products: All new solid-wood-based materials will be certified as “FSC 100%” by an independent third party in accordance with FSC Forest Stewardship Council “Principles and Criteria” and will have received Chain-of-Custody Certification as certified by an accredited certification group such as Smartwood or Scientific Certification Systems (SCS).
3. Other Wood Products: All other new wood-based materials will be certified by an independent third party in accordance with any of the following standards:
  - a. FSC: Forest Stewardship Council “Principles and Criteria” and has received Chain-of-Custody Certification as certified by an accredited certification group such as Smartwood or Scientific Certification Systems (SCS)
  - b. CSA: Canadian Standards Association Standard Z809-02 and Standard CSA Plus 1163 (chain of custody standard) administered by CSA International.
  - c. SFI: Sustainable Forestry Initiative third-party certification verifying that 100% of the wood-based content originates from third-party certified forest lands. Note that the appearance of an SFI label on a product does NOT ensure such certification; rather, such certification must come with separate documentation from the supplier, identifying the company or companies that performed the third-party certification for both the forest land management and the certified product content.
4. Preservative-treated lumber with chromated copper arsenate (CCA) treatments is not permitted, and lumber with copper-based treatments (such as ACQ) is permitted only for ground-contact applications.

5. 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. Particleboard
  - f. Plywood
  - g. Metal-plate-connected wood trusses
  - h. Structural glued-laminated timber
  - i. Finish carpentry
  - j. Architectural woodwork
  - k. Wood paneling
  - l. Wood veneer wall covering
  - m. Wood flooring
  - n. Wood lockers
  - o. Wood cabinets
  - p. Wood doors
  - q. Non-rented temporary construction, including bracing, concrete formwork, pedestrian barriers, and temporary protection

- R. Brominated Flame Retardants: For new furniture, do not utilize cushioned office seating, and for lounge seating, do not utilize cushioned seating with brominated flame retardants.
  
- S. Outdoor Air Delivery Monitoring:
  - 1. All spaces with an occupant density greater than 1 person per 40 square feet must include at least one CO<sub>2</sub> monitor located between 3 feet and 6 feet above the finished floor.
  - 2. All spaces with occupant density less than 1 person per 40 square feet must include a direct outdoor airflow monitor, capable of measuring the minimum outdoor airflow rate within 15% accuracy.
  - 3. Monitoring equipment must be configured to generate a building automation system alarm and a visual or audible alert when CO<sub>2</sub> concentrations vary by 10% or more from set point.
  
- T. Adhesives and Sealants:
  - 1. All adhesives and sealants used inside the building's thermal envelope must be third-party certified under one of the following programs:
    - a. Indoor Advantage Plus from Scientific Certification Systems, Inc.
    - b. UL GREENGUARD Gold from UL GREENGUARD Environmental Institute
    - c. Collaborative for High Performance Schools

2. All adhesives and sealants, regardless of where they are used, must comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24):
  - a. Concrete Curing Compound: 60 g/L
  - b. Concrete Sealer: 10 g/L
  - c. Concrete Form Release Agents: 0g/L
  - d. Garage Deck Sealer: 50g/L
  - e. Wood Glues: 20 g/L
  - f. Millwork and Casework Adhesives: 20g/L
  - g. Metal to Metal Adhesives: 30 g/L
  - h. Adhesives for Porous Materials (Except Wood): 50 g/L
  - i. Subfloor Adhesives: 50 g/L
  - j. Plastic Foam Adhesives: 50 g/L
  - k. Carpet Adhesives: 50 g/L
  - l. Carpet Pad Adhesives: 50 g/L
  - m. Carpet Seam Sealer: 50g/L
  - n. VCT and Sheet Vinyl Adhesives: 50 g/L
  - o. Cove Base Adhesives: 50 g/L
  - p. Rubber Floor Adhesives: 60 g/L
  - q. Wood Flooring Adhesives: 100 g/L
  - r. Ceramic Tile Adhesives: 65 g/L
  - s. Gypsum Board and Panel Adhesives: 50 g/L
  - t. Gypsum Drywall Joint Compound: 20 g/L
  - u. Portland Cement Plaster: 20 g/L
  - v. Multipurpose Construction Adhesives: 70 g/L w.  
Cast Resin Countertop Silicone Sealant: 20g/L
  - x. Plastic Laminate Adhesives: 20 g/L
  - y. General Contact Adhesive: 80 g/L
  - z. Structural Glazing Adhesives and Compounds: 100 g/L
  - aa. Silicone Sealant: 50 g/L
  - bb. Pipe Thread Sealant: 50 g/L
  - cc. Duct Sealant: 10 g/L
  - dd. Plastic Cement Welding Compounds: 250 g/L
  - ee. ABS Welding Compounds: 400 g/L
  - ff. CPVC Welding Compounds: 270 g/L

- gg. PVC Welding Compounds: 150 g/L
  - hh. Adhesive Primer for Plastic: 250 g/L
  - ii. Architectural Sealants: 250 g/L
  - jj. Single-Ply Roofing Membrane Adhesives: 250 g/L
3. Interior sealants shall not contain: mercury, butyl rubber, neoprene, SBR (styrene butadiene rubber), or nitrile.
  4. Sealants and glazing compounds formulated with aromatic solvents (organic solvent with a benzene ring in its molecular structure) fibrous talc or asbestos, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium, or their components shall not be used.
  5. Adhesives used to apply laminates, whether shop-applied or field-applied, shall contain no urea-formaldehyde.

U. Paints and Coatings:

1. Interior Paints and Coatings: For interior field-applied applications, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the chemical restrictions (Restricted Components listed below) of Green Seal Standard GS-11, Paints, First Edition, May 20, 1993; Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997; and South Coast Air Quality Management District Rule 1113, Architectural Coatings, rules in effect on January 1, 2004, as follows:
  - a. Flat Paints and Coatings: Not more than 10 grams of VOC per liter of coating less water and exempt compounds, including pigments
  - b. Non-Flat Paints and Coatings Except High Gloss: Not more than 50 grams of VOC per liter of coating less water and exempt compounds, including pigments.



- c. High Gloss Paints and Coatings: Not more than 150 grams of VOC per liter of coating less water and exempt compounds, including pigments. High Gloss Coatings are coatings that register a gloss of 70 or above on a 60-degree meter according to ASTM Test Method D 523 as specified in paragraph (e)(6).
  - d. Water-Based Polychromatic Finish Coatings: Not more than 150 g/L (150 g/L for primer and flat polychromatic paint)
  - e. Anti-Corrosive Coatings: Not more than 100 grams of VOC per liter of coating less water and exempt compounds
  - f. Sanding Sealers: Not more than 50 grams of VOC per liter of coating less water and exempt compounds
  - g. Waterproofing Sealers: Not more than 100 grams of VOC per liter of coating less water and exempt compounds
  - h. Concrete Slab Sealers: Not more than 10 grams of VOC per liter of coating less water and exempt compounds
  - i. Polyurethanes: Not more than 100 grams of VOC per liter of coating less water and exempt compounds
  - j. Stains: Not more than 250 grams of VOC per liter of coating less water and exempt compounds
- 2. Interior field applied varnishes and lacquers are not permitted.
  - 3. Interior paints shall not contain antimicrobial additives (such as fungicides and biocides).
  - 4. Exterior Paints and Coatings: For exterior applications, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the chemical restrictions (Restricted Components listed below) of Green Seal's Standard GS-11:
    - a. Flat Paints and Coatings: Not more than 50 grams of VOC per liter of coating less water and exempt compounds, including pigments

- b. Non-Flat Paints and Coatings: Not more than 150 grams of VOC per liter of coating less water and exempt compounds, including pigments
  - c. High Gloss Paints and Coatings: Not more than 150 grams of VOC per liter of coating less water and exempt compounds, including pigments. High Gloss Coatings are coatings that register a gloss of 70 or above on a 60-degree meter according to ASTM Test Method D 523 as specified in paragraph (e)(6)
  - d. Anti-Corrosive Coatings: Not more than 100 grams of VOC per liter of coating less water and exempt compounds
  - e. Varnishes and Sanding Sealers: Not more than 275 grams of VOC per liter of coating less water and exempt compounds
  - f. Stains: Not more than 250 grams of VOC per liter of coating less water and exempt compounds
5. Aromatic Compounds: Paints and coatings shall not contain more than 1% (by weight) total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
6. Restricted Components: Paints and coatings shall not contain any of the following:
- a. Acrolein
  - b. Acrylonitrile
  - c. Aniline dyes
  - d. Antimony
  - e. Benzene
  - f. Butyl benzyl phthalate
  - g. Cadmium
  - h. Di (2-ethylhexyl) phthalate
  - i. Di-n-butyl phthalate
  - j. Di-n-octyl phthalate
  - k. 1,2-dichlorobenzene
  - l. Diethyl phthalate
  - m. Dimethyl phthalate
  - n. Ethylbenzene
  - o. Formaldehyde
  - p. Hexavalent chromium
  - q. Isophorone
  - r. Lead
  - s. Mercury

- t. Methyl ethyl ketone
  - u. Methyl isobutyl ketone
  - v. Methylene chloride
  - w. Naphthalene
  - x. Toluene (methylbenzene)
  - y. 1,1,1-trichloroethane
  - z. Vinyl chloride
  - aa. Xylene
7. Coordinate with paint manufacturers for implementing a “take-back program” for all unused paint. Set aside scrap and unused paint to be returned to the manufacturer for recycling into new product. Close and seal all partially used containers of paint to maintain quality as necessary for reuse.

V. Floorcoverings:

1. Carpet shall achieve an Environmental Performance Score of 0.0200 as determined through an assessment in the Building for Environmental and Economic Sustainability (BEES) software model, either Version 3.0 or 4.0. The parameters of the model must be set in the following way for this assessment:
- a. “Environmental vs. Economics Performance Weights” shall be set at 100% Environmental Performance.
  - b. “Environmental Impact Category Weights” shall be set using the EPA Scientific Advisory Board weights.
  - c. “Transportation from “Manufacture to Use” shall be set at the lowest distance possible.
  - d. In the “Nylon Carpet Parameters” dialogue box, set “Carpet Type” as “Carpet Tile” and “Installation Glue” as “Low VOC Glue.”

2. All carpet systems, including adhesives, must meet or exceed the Carpet and Rug Institute Green Label Plus Indoor Air Quality Test Program.
  3. Carpet cushion shall not contain brominated flame retardants.
  4. Carpet tile applications shall be self-adhering.
  5. All resilient floorcovering must be certified under the UL GREENGUARD or FloorScore indoor emissions testing programs.
  6. Engineered wood flooring and bamboo flooring must be certified under the UL GREENGUARD or FloorScore indoor emissions testing programs.
- W. Composite Wood and Agrifiber Binders: All composite wood, agrifiber products, and wood doors shall contain no added urea-formaldehyde resins.
- X. Systems Furniture and Seating:
1. All systems furniture and seating meet the requirements of one of the following:
    - a. UL GREENGUARD certification
    - b. SCS Indoor Advantage certification
    - c. SCS Indoor Advantage Gold certification
    - d. BIFMA Standard X7.1-2005, as tested to BIFMA method M7.1-2005 and as verified by an independent laboratory
    - e. Calculated indoor air concentration limits for furniture systems and seating determined by the U.S. EPA's Environmental Technology Verification Large Chamber Test Protocol for Measuring Emissions of VOCs and Aldehydes (September 1999) testing protocol as conducted in an independent air quality testing laboratory
  2. Systems furniture and seating made with coatings or sealants that contain any of the following solvents are not permitted: naphtha, benzene, toluene, xylene, hexavalent chromium.
- Y. Entryway Systems: Walk-off systems to capture particulates shall be installed at least 12 feet long in the direction of entry travel at all entryways directly connected to the outdoors that are used as regular entry points by building users. Acceptable entryway systems include:
1. Permanently installed grates, grilles, or slotted systems that allow for cleaning beneath them
  2. Permanently installed direct glue-down walk-off mats
  3. Non-permanent roll-out mats, but only if a service organization is contracted for maintenance on a weekly basis

- Z. Air Filtration: Install air filtration media that provides a Minimum Efficiency Reporting Value (MERV) of 13 or better in all air handling units for processing both return and outside air that is delivered to the air supply system. Replace all filtration media after the completion of construction and prior to occupancy.
  
- AA. Mercury in Lighting:
  - 1. Provide only low-mercury fluorescent or HID lamps with mercury content limited to the following:
    - a. T-5 and T-8 fluorescent lamps: 80 picograms per lumen hour
  - 2. Measurement Standards: Lumens to be measured according to IES LM9 for linear fluorescent lamps, IES LM66 for compact fluorescent lamps, and LM51 for HID lamps; mercury content to be measured according to U.S. EPA "Total Mercury by Cold Vapor Absorption Method" 7471A.
  
- BB. Lighting Controls: Install and calibrate controls as specified by Division 26 – Electrical in order to comply with LEED IAQ lighting controllability requirements.

CC. Thermal Comfort: Install and calibrate controls as specified in Division 23 – Heating, Ventilation, and Air-Conditioning.

DD. Blended Cement Concrete:

1. Cementitious Materials: Provide composite mix of portland cement and ground granulated blast-furnace slag or fly ash or blended hydraulic cement and limit percentage (by weight) of portland cement (ASTM C150) in aggregate (total weighted average of cementitious material weight for all mixes and pours) to 40% less than standard regional concrete mix designs.
2. Limit percentage (by weight) of standard portland cement (C-150), to the following maximum percentages of the cementitious portion of the mix while maintaining the above-40% required reduction in portland cement across the Project's total quantity of concrete:
  - a. Footings: 50%
  - b. Slab on Grade: 60%, except for cold-weather pours
  - c. Insulated Concrete Form Concrete: 40%
  - d. Elevated Slabs: 60%, except for cold-weather pours
  - e. Exterior Concrete: 75%

EE. Gypsum Wallboard: Standard paper-faced gypsum wallboard can be used only in dry climates, where wetting during or after construction is not anticipated. In humid climates, where dampness and condensation are a concern, use only non-paper-faced gypsum wallboard. In wet locations a cementitious wallboard, made of portland or magnesium oxide cement, must be used.

FF. Fiberglass Insulation: Fiberglass batt insulation shall contain no formaldehyde-based binders or shall be third-party certified for conformance with UL GREENGUARD Gold or Indoor Advantage Gold.

GG. Duct Acoustical Insulation: Mechanical sound insulation materials within the duct shall consist of an impervious, non-porous coating that prevents dust from accumulating in the insulating materials.

HH. Green Housekeeping:

1. Utilize cleaning products that meet the requirements of the Green Seal GS-37 standard or comply with the requirements and maximum VOC limits of Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 8.5, Article 2, Regulation for Reducing VOC Emissions from Consumer Products (September 2001).
2. Utilize janitorial paper products and trash bags that meet the minimum percentages of post-consumer recycled content and recovered content requirements of EPA's Comprehensive Procurement Guidelines.

## PART 3 - EXECUTION

### 3.1 CONSTRUCTION WASTE MANAGEMENT

- A. Develop and implement a Construction Waste Management Plan (CWMP), as defined in Section 01 74 19 "Construction Waste Management," quantifying material diversion by weight in order to recycle, reuse, and/or salvage at least 95% (by weight) of construction, demolition, and land-clearing waste.
- B. Clean materials which are contaminated prior to placing in collection containers. Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Utilize any on-site existing paving materials that are scheduled for demolition as granulated fill or subbase material, and include the weight of this material in the calculations for material diverted from landfill disposal.
- D. Arrange for materials collection by or materials delivery to the appropriate recycling or reuse facility.
- E. Tax credits and other savings obtained or revenue generated for recycled or reused materials accrue to the Contractor.

- F. Discuss CWMP procedures and measures as an agenda item at all regular job meetings conducted during the course of work at the site, and record progress in meeting minutes.
- G. Submit monthly progress reports with Applications for Payment in accordance with Section 01 74 19, documenting the status of the CWMP and current diversion percentage rates.

### 3.2 CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

- A. Develop and implement a Construction IAQ Management Plan (CIAQMP) to prevent indoor air quality problems resulting from construction activities, including, at minimum, the following:
  - 1. Construction activities must meet or exceed the minimum requirements of the SMACNA IAQ Guideline for Occupied Buildings under Construction, 1995.
  - 2. During construction, protect all absorptive materials stored on-site or installed from moisture damage as described in the Construction IAQ Management Plan (CIAQMP) defined above. Specifically:
    - a. Exercise special care at all times in the storage of materials to prevent exposure to moisture.
    - b. Avoid installation of gypsum wallboard and other porous materials until the building is weather-tight.
    - c. All standing water which accumulates on interior floors shall be removed on the day that it is observed.
    - d. Any drywall that has retained more than 20% moisture after 48 hours following exposure to moisture, or that has evidence of mold, must be disposed of in accordance with Specification Section 01 74 19 "Construction Waste Management."
    - e. The contractor shall identify and remove all porous building materials that become wet or damaged by moisture within 7 calendar days of such exposure.
  - 3. During construction and HVAC system installation, provide the Architect with photographs of IAQ management measures (such as protection of ducts and on-site or installed absorptive materials), including six photographs on three different occasions depicting implemented SMACNA approaches.
  - 4. Sequence installation of finishes to minimize cross-contamination. Special construction scheduling involves defined and controlled sequencing of finishes applications to ensure dissipation of emissions from finishes that off-gas significant quantities of deleterious material during curing ("Type 1 Finishes"), to separate these effects from the installation of adsorptive materials ("Type 2 Finishes") that may act as



a "sink" for storage and subsequent release of these unwanted substances into building spaces and mechanical systems after project occupancy.

- a. Identify finish materials by type. Type 1 materials include, but are not limited to the following:
  - 1) Composite wood products, specifically including particleboard from which millwork, wood paneling, doors or furniture may be fabricated.
  - 2) Adhesives, sealants, and glazing compounds, specifically those with petrochemical vehicles or carriers.
  - 3) Wood preservatives, finishes, and paint.
  - 4) Control and/or expansion joint fillers.
  - 5) All hard finishes requiring adhesive installation.
  - 6) Gypsum board and associated finish processes.
- b. Type 2 finishes include, but are not limited to the following:
  - 1) 1. Carpet and padding.
  - 2) 2. Fabric wallcovering.
  - 3) 3. Insulation exposed to the airstream.
  - 4) 4. Acoustic ceiling materials.
  - 5) 5. Fabric covered acoustic wall panels.
  - 6) 6. Upholstered furnishings.
- c. Materials that can be categorized as both Type 1 and Type 2 materials shall be considered to be Type 1 materials.
- d. Include in the Construction Indoor Air Quality Management Plan a schedule of construction showing compliance with requirements of this section. Show sequence of finishes applications and allowances for curing times. Within each air zone (defined as a part of any floor area served by a single air handling unit) identify finishes, indicating their type classifications.
- e. As part of the Preconstruction Meeting, discuss the sequence of installations required under this section. The purpose of this agenda item is to assure understanding of the importance of sequencing of finishes to the overall Indoor Air Quality of the facility and to secure preliminary approval of the Contracting Officer for scheduling and installation requirements for on-site work.

B. Air Filtration:

1. Install air filtration media that provides a Minimum Efficiency Reporting Value (MERV) of 13 or better in all air handling units for

processing both return and outside air that is delivered to the air supply system; replace all filtration media after the completion of construction and prior to occupancy.

2. Install air filtration media that provides a Minimum Efficiency Reporting Value (MERV) of 8 or better for filtration media installed at return air grilles during construction if permanently installed AHUs are used during construction. Inspect weekly and replace as required.

C. Discuss CIAQMP procedures and measures as an agenda item at all regular job meetings conducted during the course of work at the site, and record progress in meeting minutes.

D. Engage an independent testing and inspecting agency to conduct a baseline indoor air quality testing program after the completion of construction and prior to occupancy in accordance with Section 01 81 09 "Testing for Indoor Air Quality."

### 3.3 COMMISSIONING

A. Commissioning: All building energy-related systems and building envelope components shall be commissioned in accordance with the requirements of Specification Section 01 91 00 "Commissioning Requirements" and related commissioning sections in other divisions in order to verify and ensure that fundamental building elements and systems are installed, constructed, calibrated to operate, and perform according to the Owner's Project Requirements, Basis of Design, and Construction Documents.

### 3.4 MEASUREMENT & VERIFICATION

A. For new construction, comply with the requirements of the International Performance Measurement & Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction, April 2003, Option B or D.

For existing buildings, comply with the requirements of the International Performance Measurement & Verification Protocol (IPMVP), Volume I: Concepts and Options for Determining Energy and Water Savings, 2001, Option B or D.

END OF SECTION 01 81 13