MAPPING THE ENVIRONMENTAL EXECUTIVE OBJECTIVE AND GREEN GLOBES v.1 - 2006

GUIDING PRINCIPLES FOR FEDERAL LEADERSHIP IN HIGH PERFORMANCE SUSTAINABLE BUILDINGS	GREEN GLOBES STANDARDS	GREEN GLOBES POINTS
I. EMPLOY INTEGRATED DESIGN PRINCIPLES		
Integrated Design Use a collaborative, integrated design process that: • Initiates and maintains an integrated project team in all stages of a project's planning and delivery. • Establishes performance goals for siting, energy, water, materials, and indoor environmental quality along with other comprehensive design goals; and, ensures incorporation of these goals throughout the design and lifecycle of the building • Considers all stages of the building's lifecycle, including deconstruction.	**Requirements:** There is a designated Green Design Coordinator with relevant credentials or experience, and the authority to do the all of the following: • Outline the overall green design framework for the project • Communicate the client's/user's intentions to the project team • Develop measurable green design performance requirements • Assist in evaluating responses against the green design objectives A collaboration session was held during the Project Initiation Stage to discuss sustainable goals and attendees include the Green Design Coordinator, Architect, Mechanical Engineer, Electrical Engineer, Civil Engineer, Owner's Representative, and one representative of each user group. In addition, hold at least two collaboration sessions before the preparation of contract documentation.	**A.1.1-.1.6**

	Identify measurable, environmental/ sustainability performance goals during the Project Initiation Stage for the following areas: • consumption of non-renewable resources • energy consumption and greenhouse gas emissions • water consumption, • emissions and effluents • indoor environment A record of decisions and "to do lists" from the collaborative sessions are distributed to the design team. The Green Design Coordinator reports to the client or designated representative following the collaborative sessions. The following assemblies have been selected based on a life cycle assessment of their embodied energy, and green house gas emissions using the ATHENA "Environmental Impact Estimator" or NIST BEES: • foundation and floor assembly materials • structural systems (column and beam or post and beam combinations) and walls, • roof assemblies • other envelope assembly materials. The service life of major building components is defined based on a life cycle costing of the building materials and assemblies.	**E.1.1** **4.5**

	State what proportion of the following materials is of standard size and fastened using fastening systems that allow for easy disassembly: • Masonry • wood/timber • Insulation • Finishes • Specialty materials • Mechanical • Plumbing and electrical • Others	
Commissioning Employ total building commissioning practices tailored to the size and complexity of the building and its system components in order to verify performance of building components and systems and help ensure that design requirements are met. This should include a designated commissioning authority, inclusion of commissioning requirements in construction documents, a commissioning plan, verification of the installation and performance of systems to be commissioned, and a commissioning report.	**Requirements:** There is an independent Commissioning Authority who reports directly to the owner. "Design Intent", "Basis of Design" and Operational Performance Requirements were documented. "Commissioning Requirements" are included in the Construction Documentation. A Commissioning Plan has been developed, OR for buildings less than 10,000 square feet, a Testing and Balancing report is specified. The installation and performance of systems is verified and a Commissioning Report prepared, OR in buildings less than 10,000 square feet, there is a Testing and Balancing Report.	**A.3.1**

	There is a Re-commissioning Manual for future operating staff to assist them in understanding and operating the commissioned systems.	
II. OPTIMIZE ENERGY PERFORMANCE		
Energy Efficiency Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and design to earn the Energy Star® targets for new construction and major renovation where applicable. For new construction, reduce the energy cost budget by 30 percent compared to the baseline building performance rating per the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Inc., and the Illuminating Engineering Society of North America (IESNA) Standard 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential. For major renovations, reduce the energy cost budget by 20 percent below pre-renovations 2003 baseline.	**Requirements:** Achieve levels of performance better than that of a building that meets the 75% target as defined by the EPA Energy Star Target Finder Energy modeling has been done using a number of runs to evaluate the effects of orientation, overhangs, exterior shading, landscaping and ventilation. The building is located, oriented, and shaded to optimize the effect of microclimatic conditions for heating or cooling. • The building is oriented such that the east/west exposure is less than the north/south exposure. • There is a 4-foot external overhang over the southern windows. • There are vertical slats external to the eastern windows to reduce direct sunlight entry early in the morning and the day. There are wind-mitigating measures (such as siting, orientation of entrances, topographical features, landscape vegetation, berms, fencing, or wind canopies) to reduce the harmful effects	**C.1.1, C.1.2** **C.2.3, 2.5** **C.2.7- 2.12** **C.2.16-18** **C.2. 20** **C.3.1-3.6** **C.3.8**

	of wind such as snow or sand deposition, thermal loss, drafts, or deterioration of the building fabric. Where there is engineered natural ventilation, the indoor temperature and humidity meet ASHRAE Standard 55 criteria on the 1% design cooling day. Glazing has a minimum visible light transmission to solar heat gain coefficient ratio (VLT/SHGC) of 1.55 or higher. The thermal resistance of the building envelope meets requirements of ASHRAE 90.1 OR The thermal resistance of the building envelope exceeds the requirements of ASHRAE 90.1. The building's fenestration system meets or exceeds the ASHRAE 90.1 thermal transmittance factor. Solar Heat Gain Coefficient (SHGC) of the building's fenestration system meets or exceeds ASHRAE 90.1. The following practices are implemented with respect to the air barrier to help assure the integrity of the building envelope: • There is a continuous building envelope air	

	barrier membrane joined in an air-tight and flexible manner to adjacent assemblies. • There is a mock-up of the air barrier system. • Whole building testing of air tightness via blower door or whole building pressurization was conducted. • Stack effect is controlled by air sealing and compartmentalizing vertical building shafts (stairs, elevators) from the main space. The integrity of the building envelope is optimized using best vapor retarder practices. • The vapor retarder is installed as required by the type of assembly and the climate region. • Calculations have been done to define the location and permeance of the vapor retarder as per *ASHRAE Handbook of Fundamentals.* OR Dynamic modeling has been done to provide assurance of the effectiveness of the vapor retarder. The following are automatic controls to turn off lights when rooms are unoccupied: • Lights switch on and off based on automatic time-of-day clock. • There are occupancy sensor controls in each room or per 400 square feet of floor space, whichever is smaller. There are the following building controls: • HVAC controls with time of day scheduling	

	or temperature setback • Full Building Automation Systems There are the following automated natural ventilation control mechanisms: • Automatic operable windows, window treatments or vents provide fresh air directly from outside in response to room and external temperatures. • Interlock between the use of operable windows and automated HVAC control avoids wasting energy, for example, by opening a window to cool down a space which is being heated. The building contains the following vertical transport features to conserve energy. • Capability of shutting down elevators for part of the day. • Capability to slow down or stop escalators when detectors indicate no traffic. Lighting power densities are at or below those indicated in ASHRAE Standard 90.1 and BENCHMARK. There is an efficient electric lighting system (T5 or T8 or metal halide) with electronic ballasts, designed to be supplemented with task-lighting. Cooling equipment meets or exceeds the recommended seasonal energy efficiency ratio (SEER) or Energy Efficiency Ratio (EER)	

	indicated in ASHRAE Standard 90.1. There are measures (such as multiple compressors or modular boilers) to reduce the capacity and operate efficiently at part loads, yet meet the minimum HVAC requirements. The heating equipment meets or exceeds the recommended annual fuel utilization efficiency (AFUE) or Thermal Efficiency for indirect gas-fired heater at the required capacity. For heat pump applications, the heating efficiency meets or exceeds the ASHRAE Standard 90.1 heating seasonal performance factor (HSPF) or the coefficient of performance (COP) for the required capacity. Fan power is improved by the following measures: • A duct distribution system that has diffusers and registers sized with a full flow pressure drop no greater than 0.01 inch of water column, and noise criteria (NC) of 35 or less; supply and return ductwork sized with a pressure drop no greater than 0.08 inches of water column per 100 lineal feet of duct run • Flexible duct work that is limited to 10 ft. or less; limited to connections between duct branches and diffusers, and connections between duct branches and variable air volume terminal units; installed with durable	

	elbow support when used as an elbow • Sealed duct joint and seams are leak-tested at the rated pressure with overall leak rate less than 10%. • There is insulated ductwork for all supply air ductwork; for return ductwork located above insulated ceilings immediately below the roof or in unconditioned spaces; for all outdoor ductwork; for all exhaust and relief air ductwork between the motor-operated damper and penetration of the; along with vapor retardant on the outside of the insulation where condensation is possible. • Motors for fans that are 1 horsepower or more meet National Electric Manufacturers' Association (NEMA) premium efficiency motor guidelines.	
Measurement and Verification. In accordance with DOE guidelines issued under section 103 of the Energy Policy Act of 2005 (EPAct), install building level utility meters in new major construction and renovation projects to track and continuously optimize performance. Compare actual performance data from the first year of operation with the energy design target. After one year of occupancy, measure all new major installations using	**Requirements:** There is sub-metering for lighting panels, air handling units, chillers, pumps, hot water heaters, furnaces, and boilers. Provide energy sub-metering for tenants and/or individual cost centres, functions, or equipment which use large amounts of energy The installation and performance of systems is verified and a Commissioning Report prepared,	**C.2.13** **GG-EB A.3.11** **A.3.1** **GG-EB A.1.1**

the Energy Star® Benchmarking Tool for building and space types covered by Energy Star®. Enter data and lessons learned from sustainable buildings into the High Performance Buildings Database. (www.eere.energy.gov/femp/highperformance/index.cfm)	OR in buildings less than 10,000 square feet, there is a Testing and Balancing Report. Achieve levels of performance (based on the submitted total energy bill) better than that of a building that meets the 75% target as defined by the EPA Energy Star Target Finder	
III. PROTECT AND CONSERVE WATER		
Indoor Water. Employ strategies that in aggregate use a minimum of 20 percent less potable water than the indoor water use baseline calculated for the building, after meeting the Energy Policy Act of 1992 fixture performance requirements.	**Requirements:** Provide the percentage of water savings (gallons/square foot) achieved by specifying fixtures that exceed the requirements set forth in the Energy Policy Act of 1992. Provide the evidence of meeting the water consumption benchmarks achieved through installed water-conserving features and implementing water-management best practices that exceed the requirements set forth in the Energy Policy Act of 1992. There is sub-metering of high-water use operations and/or occupancies with high usage (such as wet-cooling towers, irrigation, commercial kitchens, laundries, laboratories, sports facilities and DHW boilers). Sub-metered high-water use operations include: • Wet-cooling towers • Irrigation	**D.1.1** **GG-EB B.2.1** **D.2.1, 2.2**

	• Commercial kitchens, laundries, laboratories and sports facilities • DHW Boilers Where wet cooling towers are used, they have the following features to minimize the consumption of make-up water. • Make up water is from stored rain water source • Automatic control (to shut off the unit when the facility is unoccupied such as at night or on weekends, or to operate it concurrently with chillers) • Conductivity probes (to measure the total dissolved solids so as to minimize the blowdown cycle) • Automated blowdown systems (so that blowdown is done only as needed, rather than routinely) • Delimiters (to reduce drift and evaporation) • Water data loggers (to measure water that is not discharged to sewage system, such as water that has evaporated from the cooling tower)	
Outdoor Water. Use water efficient landscape and irrigation strategies to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities). Employ design	**Requirements:** Trees, shrubs and groundcover are native to the area (as listed in local Plant Society documentation). The landscaping avoids the need for irrigation altogether OR 100% of the irrigation consists of	**B.4.1** **D.2.3- 2.8** **D.3.1, 3.2** **GG-EB B.2.1.4-5**

and construction strategies that reduce storm water runoff and polluted site water runoff.	non- potable water. Lawn is avoided or restricted to within 20-feet of buildings and 5-feet of parking, driveways, and walkways. Where potable water is used for irrigation, there is a water-efficient system that uses the following: • Low-volume, low-angle sprinklers with sprinkler heads that fit the size and shape of the areas to be watered • Drip or sub-surface irrigation - alone or in combination with low-volume, low angle sprinkles with sprinkler heads that fit the size and shape of areas to be watered • Programmable controllers with adjustable watering scheduling • Moisture sensors Landscape plantings (including lawn turf) have "low supplemental watering requirements" based on local references (i.e. a Local or State Plant Society Native Species Planting List). The landscaping avoids lawn. OR Lawn areas are specified only for functional purposes such as a designated picnicking area or playing field. There is a gray water collection, treatment and distribution system.	

	An on-site black wastewater treatment system and/or composting toilets are specified.	
IV. ENHANCE INDOOR ENVIRONMENTAL QUALITY		
Thermal Comfort. Meet the current ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality.	**Requirements:** The building design conforms to the ANSI/ASHRAE 55-2004 Thermal Environmental Conditions for Human Occupancy OR The building achieves Benchmark 1 for thermal comfort using the Center for the Built Environment Occupant Satisfaction Survey. Indicate the size of the thermal control zones: • Control zones are no more than 1,000 square feet. • In office areas, there are controls for medium-sized zones such as conference rooms or 4 cubicles. • There are controls for small zones such as a single workstation or a washroom. Provide sufficient ventilation to obtain acceptable IAQ, in accordance with ASHRAE 62.1-2004	**G.4.1-4.2** **G 1.2** **GG-EB E.1.7** **GG-Fit-up (CI) F3**
Moisture Control. Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage and mold contamination.	**Requirements:** There are the following interior measures to control moisture and prevent the growth of fungus, mold, and bacteria on building surfaces and in concealed spaces: • Humidity control/cooling equipment	**G.2.1,** **C.2.12** **GG-EB E.1.25** **E.4.1-4.2**

	maintains the indoor relative humidity at or below 50% on a 1% design heating day. • Moisture tolerant materials and finishes are specified in areas which generate a lot of humidity. • There are floor drains where fixture or appliance failures may cause plumbing leaks. • There is exhaust capable of drawing 25 L/s (50 cfm) in humid areas. The integrity of the building envelope is optimized using best vapor retarder practices: • The vapor retarder is installed as required by the type of assembly and the climate region. • Calculations have been done to define the location and permeance of the vapor retarder as per *ASHRAE Handbook of Fundamentals* OR • Dynamic modeling has been done to provide assurance of the effectiveness of the vapor retarder. Envelope design meets regional best practices to control rain penetration (i.e. there specific measures such as overhangs, flashings, drainage planes that overlap flashing slopes, appropriately located and sized weep-holes) There are measures to control the entry of groundwater (e.g. slope, damp proofing membrane, weeping tiles, granular capillary	

	break and drainage along foundations)	
Daylighting. Achieve a minimum daylight factor of 2 percent (excluding all direct sunlight penetration) in 75 percent of all space occupied for critical visual tasks. Provide automatic dimming controls and accessible manual, motion and photo-sensor lighting controls, and appropriate glare control.	**Requirements:** Daylighting is maximized through the following strategies: • Integration of the smallest effective aperture value (window-wall ratio x visual light transmission (VLT)) meeting daylight needs, and which falls between 0.15 – 0.30. • Continuous windows located close to the ceiling line to distribute light deeper into the space • Other day-lighting strategies (e.g. light shelves, atria skylights, north-facing clerestories to provide daylight in interior zones). The building has the following daylight related lighting controls. • Separate controls for lighting in areas within 20 ft. of windows • Integrated controls within 20 ft. of N/S window walls or within 8 ft. of a skylight edge to adjust electric lighting to daylighting levels The following are automatic controls to turn off lights when rooms are unoccupied: • Lights switch on and off based on automatic time-of-day clock. • There are occupancy sensor controls in each room or per 400 square feet of floor space, whichever is smaller. Provide % of primary “leasable” space that	**C.2.4,** **C.2.14, C.2.16** **G.3.1** **G.3.3** **G.3.5** **GG-EB E.1.44, 47, 48** **GG-Fit-up (CI) F4.2**

	receives minimum daylight illumination levels of 25 footcandles. There are solar shading devices to enable occupants to control brightness and glare from direct sunlight as needed on south, west and east exposures. There are the following measures to avoid excessive direct or reflected glare: • Environments for visual display terminals are uniformly illuminated. • For direct lighting, the average luminance does not exceed the following values for given sharp-cut-off luminaire angles (shown in degrees from the vertical). 850 cd/m^2 at 65° 350 cd/m^2 at 75° 175 cd/m^2 at 85° • Walls are illuminated. • There is adequate distance between the luminaries and the ceiling (these vary with design of the unit).	
Low-Emitting Materials. Specify environmentally preferable adhesives, sealants, paints (undercoatings and topcoats), carpet systems, and furnishings with no or low volatile organic compounds.	**Requirements:** Materials specified are low-VOC emitting and third-party environmentally certified with the following VOC limits: • Construction adhesives: the greater of 15% by weight or 200 grams/liter • Sealants and caulks: the greater of 4% by weight or 60 grams/liter	**G.2.9** **GG-Fit-up (CI)** **F2.7**

	• Contact adhesives: the greater of 80% by weight or 650 grams/liter • Paints: Interior latex coatings flat 100 grams/liter Non flat 150 grams/liter Interior oil-based 380 grams/liter • Carpets: 50 grams/liter or no carpeting	
Protect Indoor Air Quality during Construction. Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor's National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 1995. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60 percent.	**Requirements:** There is a construction/renovation indoor air quality management plan that meets the following requirements: • Air contaminants, such as odors or irritants generated during renovations, are controlled by one of the five basic options (i.e. source removal, source modification, air cleaning, dilution ventilation, or exhaust ventilation). • Building materials made of organic matter (e.g. wood, plasterboard) or those that may collect organic matter such as leaves or insects are protected at the construction site and in transit. • Ventilation system components, insulation, and vapor retarders are kept clean, dry, and under cover until they are installed. • The building envelope is weather-tight before installing interior walls, wood floors or ceilings, or HVAC. • The HVAC is not used for heating, cooling or humidity control during construction. (Portable heaters, fans or cooling units may	**G.1.5, 1.6**

	be used). • Air-tight covers are installed over diffusers, registers, grilles, and open ducts during construction, and are not removed until major construction is complete. • The building is flushed with 100% outdoor air two weeks before the building is occupied. OR Baseline IAQ testing after construction shows acceptable air quality. • Air filters are changed just before building is occupied. There Are air filters with a dust-spot rating between 60% and 85% OR a Minimum Efficiency Rating Value (MERV) of 8 for air distributed to occupied spaces.	
V. REDUCE ENVIRONMENTAL IMPACT OF MATERIALS		
Recycled Content. Use Environmental Protection Agency designated products containing the highest percentage of recycled content practicable. Use materials with recycled content such that post-consumer recycled content constitutes at least 5 percent of the total value of the materials in the project or combined post-consumer and half post-industrial recycled content constitutes at least 10 percent.	**Requirements**: State proportion of building materials that contains recycled post-consumer content.	**E.2.2** **GG-Fit-up (CI)** **D2.1**
Biobased Content. Use biobased	**Requirements:**	

products made from rapidly renewable resources~~,~~ and certified sustainable wood products.	State proportion of materials that are bio-based products (such as green chemicals, insulation, renewable plastics, natural fibers and natural structural materials). State proportion of solid lumber and timber panel products that originates from sustainable sources that are third-party certified by the Sustainable Forestry Initiative (SFI), CSA Sustainable Forest Management (SFM), Forestry Stewardship Council (FSC), or the American Tree Farm System (AFS).	**E.2.3** **E.2.4** **GG-Fit-up (CI)** **D2.5**
Construction Waste. Recycle or salvage at least 50 percent of construction, demolition and land clearing waste, excluding soil, where markets or on-site recycling opportunities exist.	**Requirements:** State what the proportion (by weight) of construction, demolition and renovation waste is diverted from landfill. For every 10,000 square feet of occupied space, there is at least 20 square feet of designated storage space for recyclable waste or 100 square feet for buildings with more than 50,000 square feet of occupied floor space. There is space for a recycling dumpster next to the general waste dumpster.	**E.5.1-5.3** **GG-EB C.1.5.-7.** **GG-Fit-up (CI)** **D5.2**
Ozone Depleting Compounds. Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable	**Requirements:** The building avoids ozone depletion and global warming caused by refrigerants (i.e. There are no refrigerants or only absorption cooling is	**F.2.1-2.3** **GG-EB D.2.3.-6.**

products are available, consistent with the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990.	used.) Where HFC (hydrofluorocarbon) or HCFC (hydrochlorofluorocarbon) refrigerants are specified, their ozone-depleting potential (ODP) is 0.05 or less. The global warming potential (GWP) of the refrigerant is less than 150.	